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ABSTRACT

This final report summarizes all phases of a completed longitudinal research program investigating intellectual growth and vocational development of students from fifth to twelfth grade. Student development over time was studied as an interaction be-ween school, community and family, with each factor influencing ...er choice. Research objectives are outlined and the results are su...rized with supportive data and analyses presented in the tables ... appendices. For the two interview schedules and three questionnaires which are also included, see TM 000 915-916, and TM 000 862-864. (CK)

FINAL REPORT

Project No. 6-1830
Grant No. OEG-1-6-061830-0650

A STUDY OF INTELLECTUAL GROWTH AND VOCATIONAL DEVELOPMENT

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Educational Testing Service
Princeton, New Jersey

March 1971

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
Office of Education
Bureau of Research

Final Report

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A Study of Intellectual Growth and Vocational Development

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U.S. DEPARTMENT OF

HEALTH, EDUCATION, AND WELFARE

Office of Education
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Foreword

This is the final report of a program of research conducted in two phases, the first from April 1, 1966 to January 31, 1967 and the second from November 1, 1967 to June 30, 1970. The first phase of the research was fully described in an Interim Report dated June 30, 1967. This final report focuses primarily on Phase II of the research, but the major results of Phase I are also included. Those results which are not included are summarized here and have been published elsewhere and references will be given shortly, so it is not necessary for the reader to have both a copy of the Interim Report and the Final Report.

The project was conducted as a number of smaller studies, each under the direction of an experienced researcher. Regular staff meetings, where plans were reviewed and results were discussed, along with the exchange of working papers and memoranda among the staff, provided coherence and coordination to the total effort. With a few exceptions, which also will be noted in Chapter 1, a chapter of the final report is devoted to each of the separate studies conducted. The authors of these chapters are the authors of this report. Not listed as authors are a number of people who made valuable contributions to the project: Susan C. Pierson, Eleanor Williams, and Karen Yaguda, successive administrative assistants to the director; Linda K. Morse, Barbara Rollman, Ingeborg Stiebritz, Stephen Pensak and Irene Busanovich, research assistants; Romona B. Huff and Christine Sansone, secretaries. We are indebted to the advisory committee: William Cooley, Bruce Eckland, Norman Frederiksen, Philip McPherson, Roger A. Myers, W. Benton Schrader, Benjamin Shimberg, and especially Edward Landy who served as chairman of the committee. Alice Y. Scates, the original USOE Project Officer for the study, w exceptionally helpful and her successors, Judith Weinstein and Susan Klein, have been equally so.

Thomas L. Hilton
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Chapter 1

The Problem

Thomas L. Hilton

A major goal of American secondary education, accepted by educators and laymen alike, is the guidance of the student in the selection of and preparation for a vocation. To this end, a considerable body of theoretical and empirical work has been carried out in recent years, in an effort to increase understanding of the nature of intellectual and vocational development; yet we remain in considerable ignorance as to the nature of the interactions between the student and his environment which lead to particular educational programs or career choices. We are better informed about the career choices and educational decisions of those students who are college-bound than of those terminating their educational programs with secondary school or with a limited period of subsequent specialized vocational training. We still know very little about the nature of academic, socioeconomic, or other handicaps which may prevent certain individuals from succeeding in those programs which are available.

Continued research on the nature of intellectual and vocational development will contribute greatly to the solution of many educational problems. Knowledge is required, for example, of the major determinants of each student's choice of high school program. How does the changing pattern of each student's abilities and achievements influence this choice? When are differences among students in each curriculum first detectable? What effect does enrolling in a particular curriculum have on the student's growth in basic skill and achievement?

Very generally, our point of view is that student development involves an interaction over time between the student--his perceptions, skills, beliefs, needs, and values--and his environment, especially his family and his peers. Super's (1953) ten propositions served as the initial theoretical basis for the research, with certain modifications, which were suggested by research on career decision-making (Hilton, 1962). Super's sixth proposition is especially relevant:

> The nature of the career pattern is determined by the individual's parental socioeconomic level, mental ability, and personality characteristics, and by the opportunities to which he is exposed (1953, p. 190).

Developing this proposition into a set of specific hypotheses, and obtaining results which were relevant to them were the overall goals of this research. Achieving these goals required, first, an extended period of logical analysis and hypothesis generation; second, an extensive body of data for hypothesis testing; and, third, analytical methods capable of unraveling the complex multivariate processes which underlie the vocational development in question.

The Need for Longitudinal Data. The data requirements were, indeed, extensive. Generally speaking we were interested in how the student's attributes, in interaction with family, school, and community variables, change over time as a result of the student's experiences. For example, what effect does attending a junior high school with a particular curriculum and community socioeconomic setting have on the subsequent growth in ability and achievement of a student who lives in a particular setting and who is enrolled in a particular high school vocational program and who in junior high school exhibited a certain amount of growth?

To answer questions of this type one needs longitudinal data. And since growth in significant aspects of development is slow and not easily measured, data covering a period of years are required. Furthermore, measuring instruments were required which could be given to the same students repeatedly without producing serious ceiling or practice effects. Finally, a large and representative sample of pupils was required if we were successfully to explore the significant subgroups into which the sample naturally was divided.[1]

Fortunately, data relevant to the problem were already being collected. In 1961, in cooperation with the College Entrance Examination Board, Educational Testing Service initiated a Study of Academic Prediction and Growth, in order to obtain data by means of which the mental abilities and academic achievement of a large national sample of students could be traced over the eight-year period from the beginning of grade 5 through the end of grade 12. ETS initiated the Growth Study not only to have data to describe the intellectual development of American adolescents, but also to accumulate data necessary for longitudinal studies by the research staff--studies precisely like those to be described in the following pages.

Summary of Related Research

In reviewing the pertinent literature, studies regarding interests and abilities (Super, 1961; Tiedeman, 1952; Berdie, 1944), SES and parental influence on choice of curriculum on career (Berdie, 1943; Gribbons & Lohnes, 1964; Kahl, 1953), the influence of the school and community (Jones, 1952; Davis, Hagen, & Strouf, 1962; Flanagan et al., 1962), the bases for curriculum and career choices made by ninth-grade students (Super & Overstreet, 1960; O'Hara & Tiedeman, 1959), the stabilit of choices made by ninth-grade students (Ginzberg et al., 1951; Flanagan & Cooley, 1965), and the unresolved issues in vocational development (Super, Tiedeman, & Borow, 1961; Ginzberg et al., 1951), are found.

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[1] If, for example, one starts with a total sample of 40,000 and makes two sex divisions, four grade-level divisions, three SES divisions, three school-type divisions and five curriculum divisions, the resulting samples will have a mean N of about 110. For most statistical purposes at least this many cases are desirable.

Most of the studies done have been cross-sectional in design. Few have involved repeated testing of the same students' academic development and change of vocational interests from junior through senior high school. Furthermore, most of the studies have been based on samples of such limited size that it has not been possible to examine homogeneous subgroups of the sample separately. In some, for example, it has been necessary to combine boys and girls in one sample. Finally, most of the studies have not achieved as broad a coverage of abilities and achievement as is desirable. Ability and achievement have frequently been measured by means of a single instrument of limited reliability, with the result that these variables have accounted for only a small share of the variance under study.

The Growth Study is unique in that the students have been retested biennially in a variety of areas, and in that the schools from which the sample was drawn represent a broad range of U. S. school-types and curriculum combinations: schools which send 75% of their students to college as well as schools which are exclusively vocations, rural and urban schools, and schools from both culturally advantaged as well as disadvantaged areas. With the possible exception of Project Talent (which, however, does not employ the technique of repeated measurement of ability and achievement), none of the studies examined encompasses the scope, the number of variables, or the time periods found in the Growth Study.

The studies which have been done are valuable as sources of hypotheses. The working assumption of the research described in this report, however, was that repeated measurement of the achievement, aptitudes and interests of national samples is essential to rigorous hypothesis testing in vocational development research.

Objectives

The following were the original objectives of the research. Subsumed under each are certain questions of interest described in the following chapters.

Objective I: To obtain a description of the kinds of vocational educational curricula in a nationwide sample of high schools, and a description of the characteristics of the students enrolled.

a. What are the major subgroups of students within the vocational education area, and are there significant differences among these groups in ability, achievement, and certain noncognitive attributes?[2]

[2]The phrase vocational education is commonly used in a variety of ways. In this work we used the phrase in reference to any secondary school program designed for students who do not intend to complete four years of college. Thus, we did not restrict it only to programs for which funds are provided under the several national vocational education

b. Are there significant regional or community differences in the number and the attributes of students enrolled in the different vocational programs?

Objective II: To trace the intellectual development of students who subsequently elect vocational, as opposed to college preparatory, programs in high school.

a. Do the aptitude and achievement of students in various vocational programs develop at the same rate as they do for students in college preparatory programs?

b. Are there achievement differences at the 7th grade level between those who at the 9th grade level elect vocational programs and those who elect college preparatory programs? (This question can be investigated only at schools where a choice is made at the 9th grade level.)

c. Can choice of high school program be predicted from these 7th grade achievement differences?

d. Are there differences at the 7th grade level in family background and school characteristics between students who elect a vocational program as compared with a college preparatory program, that are not accounted for by a factor of general ability?

e. If differences are found in family background and school characteristics at the 7th grade level, do the same differences exist at the 5th grade level?

f. Can choice of high school curriculum be predicted from differences among the students at the 5th grade level?

g. How early does a student decide or come to know which curriculum he will take in high school?

h. To what extent does he make a deliberate "choice" as opposed to having a choice result from environmental circumstances?

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acts. We recognized, however, that testing certain hypotheses required that distinctions be made within the vocational educational area (between home economics and business education, for example). Furthermore, as Conant has pointed out, "anything that is said or written on the subject of vocational education must be considered in connection with the state in which the high school is located" (1959, p. 127). Accordingly, before the data from school systems in different states were pooled we tried to make sure that the sample parameters were comparable.

i. Does the 7th grade choice or expectation in regard to high school program have any observable relationship with intellectual development? In other words, is the change in test scores from the 7th to the 9th grade of students who anticipate a vocational program different from the change of students who anticipate a college preparatory program?

j. Do differences between vocational and college preparatory groups in 9th or 11th grade test performance exist when initial differences in ability and achievement, background, and school characteristics are held constant?

k. How stable are early (7th grade) expectations in regard to high school programs? Which students change plans, and what are their characteristics? Is there any relationship between change in plans and enrollment in particular programs?

l. Are changes in the students' backgrounds and experiences in the 7th to 9th grade period and in the 9th to 11th grade period associated with changes in the students' vocational aspirations?

Objective III: To investigate the interaction of stated vocational plans, academic preparation, individual characteristics, and subsequent educational or vocational involvement.

a. What are the characteristics of students whose plans are congruent with subsequent involvements, and those whose plans are not, i.e., those whose plans do not materialize?

b. Are characteristics of the schools related to this congruence or lack of it?

Objective IV: To relate the appropriateness of student planning in terms of post-high school educational or vocational involvement to characteristics of the secondary school he attended, including the curriculum in which he was enrolled.

a. What school characteristics are associated with more appropriate planning?

Objective V: To develop a preliminary theoretical model of vocational development, covering the years from 5th to 12th grade.

a. What are the critical variables in such a model?

b. Given the specific student, family and school characteristics, what predictions can be made concerning the proportions of students in particular schools who elect vocational programs as opposed to college preparatory programs?

c. Do the data fit predicted proportions? What conditions appear to account for discrepancies between predictions and observations?

The preceding were the original objectives of the project. As every project proceeds, however, the objectives undergo revisions. Some objectives prove to be unrealistic and are reformulated or postponed for future research. Others are found to require much more emphasis and articulation than in the original proposal. Or needs are discovered which were not emcompassed under the original objectives, and new objectives are created. The experience of this project was no exception. The description of the research studies which follows constitutes the best description of the evolving changes in the project's objectives, but a few generalizations can be offered here. First, there should have been in the list of objectives a sixth objective stated something like the following:

Objective VI: To develop the statistical methods necessary for the analysis of data on student development.

Repeatedly, when a member of the Vocational Development staff undertook the design of a study to answer one of the questions listed on the previous pages, he would find that existing techniques were so inadequate as to cause him to postpone the substantive research indefinitely and to concentrate on developing the necessary techniques. The methodological work by Freeberg and Rock (Appendix A), Katz (Appendix C), Rock and Evans (Chapter 10), Werts (Appendix B) are examples.

Objective VII: To investigate the influence of school, community and regional variables on educational decision-making and student achievement within the school.

The staff frequently observed differences in the mean achievement among schools without any obvious explanation for these differences. In pursuit of possible explanations, one staff member did what might be described as a clinical study of three schools which by many criteria were similar: they were approximately the same size, had fully adequate physical plants, roughly comparable curriculum offerings, and comparable teaching staffs. Some ways in which the schools differed and the possible effect of these differences on achievement are described in Chapter 7 by Casserly and Coffman.

Still another objective would have been as follows:

Objective VIII: To investigate the possible causes of school withdrawals.

Early in the project, the staff realized it was possible to supplement the project's extensive file or data on each student's achievements with data on an equally important educational outcome, namely, whether the student remained in school through high school. This drop-out study by Evans and Patrick is described in Chapter 9.

Lastly, the following objective should have been included:

Objective IX: To compare the achievement of Negro and white students within different academic programs in different schools.

This project was undertaken with the encouragement of the Bureau of Research, in part to see whether the achievement differences observed in the cross-sectional data of the Coleman study would be observed in the longitudinal data of the Growth Study. Chapter 8 by Rosenfeld and Hilton describes the results.

Having described some of the additions to the original objectives of the project, let us now mention some deletions or, if not deletions, some objectives which received less attention than originally anticipated.

The most notable absence from this final report is a chapter concerning a theoretical model of vocational development. Theoretical considerations entered into the design of most of the substudies conducted, and the discussions of results frequently involved theoretical issues, but the staff did not attempt to integrate these thoughts into a theoretical model, not because this was not regarded as desirable, but because it was regarded as premature. A well-developed theoretical model is sorely needed, but if such a model is to be any more than a superficial collection of speculations, a large investment of high-level staff time will be required.

A second omission from this final report concerns school characteristics which are associated with "more appropriate planning" (Objective IV). The staff originally hoped to be able to characterize students on the basis of follow-up information in accordance with the apparent success of their vocational preparation and planning, and then to look back at the high schools they attended to see if the schools attended by the more successful students were different in any measurable ways from those attended by the less successful students. In retrospect, however, this objective is like the goal of developing a theoretical model--a noble objective, but not a practical one given the present state of the art of criterion development. The problem is primarily one of time span. Who is to say that one student has been more successful than another on the basis of his experiences one to three years after being graduated from high school?

Also, who is to say that a given student should go to college? We tend to assume in our U. S. culture that any young person who has the ability should in his own interest and in the country's interest go to college. But how justified is this assumption? Suppose that a highly able young man in a college preparatory program decides that what he really wants to do is attend a two-year technical school and become a television service man. Are we, as researchers, to categorize him as vocationally maladjusted, or as having been inappropriately educated given his vocational choice? The authors of this report, at least, were wholly unwilling to make such a value judgment. The approach taken by the staff was, rather, a more descriptive one, in which the post-high school education and occupation of the subjects are described and related to their earlier educational experiences. Chapter 11 describes these results.

The reader will, then, not find in this report specific suggestions for the reformulation of public school course-offerings or suggestions for the restructuring of public school education. We view the work, rather, as basic educational research, designed to throw light on some of the critical questions which underlie day-to-day operational and policy questions in the schools. The questions critically need answers. The research staff would hope that the studies reported in the following chapters will contribute eventually to such answers.

Chapter 2

The Sample, Data, and Procedures

In view of the longitudinal nature of most of the research's objectives it was critical to have longitudinal data for the investigation. Hilton and Patrick (1970), for example, demonstrated that observed growth rates depend importantly on school attrition rates from grade 5 to grade 11. Except under special conditions, which rarely hold, cross-sectional data are not a satisfactory substitute for longitudinal data. Fortunately, the staff had access to the extensive data files of the Growth Study and relied heavily on those files in conducting the current investigation.

Testing Plan. The testing plan for the Growth Study is shown in detail in Figure 1. From the figure, one can see that it incorporates both a cross-sectional and a longitudinal design, i.e., in 1961 different students in grades 5, 7, 9, and 11 were tested, and since then the same students were tested every two years until they were graduated.

Sample. The 17 communities participating in the Growth Study and the names of their high schools, totaling 27, are shown in Figure 2. The Growth Study population consists of the students in these high schools and in all the junior high schools and elementary schools feeding them. The initial sample consisted of approximately 9,000 fifth graders, 9,000 seventh graders, 9,000 ninth graders, and 5,000 eleventh graders, giving a total of 32,000 subjects.

By 1963, when all subjects were tested for the second time, 93% of the original subjects remained, but since the Growth Study makes a practice of testing all the students in the relevant grades of the school, whether or not they had participated in previous administrations, the total sample had grown to slightly less than 40,000. In each subsequent testing the total sample increased by 25% while the "core" sample with complete data decreased by 15%. Presently, there are 45,901 in the total sample and 15,124 in the core sample. When a student leaves a "Growth Study" school no effort is made to follow him to his new location.

Selection. The schools were selected to provide a range in geographic location, size of system, and proportion of senior class graduates who subsequently attended college. Although all the high schools are comprehensive, the proportion of students enrolled in vocational education curricula varies markedly from one school to another. The average enrollment in such programs is approximately 40%.

The opportunities we have had to compare the Growth Study sample with randomly selected nationwide samples indicate that the Growth Study sample quite closely approximates a randomly selected sample. In Figure 3 the Growth Study is compared to the sample obtained in the Survey on Equality of Educational Opportunity, the so-called Coleman Study, the sampling for which was carefully done. The similarity of the two frequency distributions is quite striking. The suggestion is that the Growth Study is slightly

Figure 1. Testing Plan for the Study of Academic Prediction and Growth

Grade	Sept.-Oct. 1961	Jan.-Feb. 1963	Sept.-Oct. 1963	Jan.-Feb. 1965	Sept.-Oct. 1965	Jan.-Feb. 1967	Sept.-Oct. 1967	Jan.-Feb 1969
5	TGI-L SCAT-5B STEP-4B N=8939							
7	TGI-L SCAT-4B STEP-3B N=8891		TGI-M BEQ-7 SCAT-4B STEP-3B N=8361					
9	TGI-M SCAT-3B STEP-3B N=9245		TGI-H BEQ-9 SCAT-3B STEP-3A N=8724		TGI-H BEQ-9 SCAT-3B STEP-3A N=7671			
11	TGI-H SCAT-2B STEP-2B N=5294		TGI-H BEQ-11 SCAT-2B STEP-2B N=7790		TGI-H BEQ-11 SCAT-2B STEP-2B N=7383		TGI-H BEQ-11 SCAT-2B STEP-2B N=6304	
12		Sr. Quest. BEQ-12 Am. Hist. Eng. Comp. PSAT N=4854		Sr. Quest. Am. Hist. Eng. Comp. PSAT N=6750		Sr. Quest. Am. Hist. Eng. Comp. PSAT N=5891		Sr. Quest. Am. Hist. Eng. Comp. PSAT N=5674
Total Ss per Administration	32,369	4,854	24,875	6,750	15,054	5,891	6,304	5,674

Note: The numbers of Ss indicated for the years 1965 to 1969 are estimates. These totals combine public and independent school counts.

Region of U.S.	12th grade enrollment: Over 200			100-200	Under 100		
	% college going: Under 35	35-70	Over 70	% college going: 35-70	% college going: Under 35	35-70	Over 70
New England Middle Atlantic	Erie, Pa: East H.S. Memorial Tech.	Erie, Pa: Academy H.S. Strong V.	-	-	Ipswich, Mass.	Warwick Valley N.Y.	Cohasset, Mass.
E. No. Central W. No. Central	Akron, Ohio: South H.S. Hower Voc.	Akron, Ohio: Kenmore	Akron, Ohio: Buchtel H.S. Firestone	Mt. Healthy, Ohio	Frazee, Minn.	Bronson, Mich.	W. Lafayette, Ind.
W. So. Central So. Atlantic E. So. Central	Atlanta, Ga: W.F. George	-	Atlanta: Dykes	Yazoo City Miss.	Havre de Grace, Md.	Lampasas Texas	-
Mountain Pacific	Oakland, Cal.: Castlemont	-	Oakland, Cal.: Oakland H.S. Skyline H.S.	La Junta, Colorado	Elma, Wash.	Burton, Wash.	-
No. of Schools	6	3	5	3	4	4	2

This chart presents the classification as it stands in 1969. One school system dropped out in 1962 (Lynnfield, Mass.: 100-200, 35-70%); and a second school in 1963 (Canyon, Texas, <100, >70%); a new school was established in Akron in 1963 (Firestone: >70%).

Figure 2. High Schools in Study of Academic Prediction and Growth.

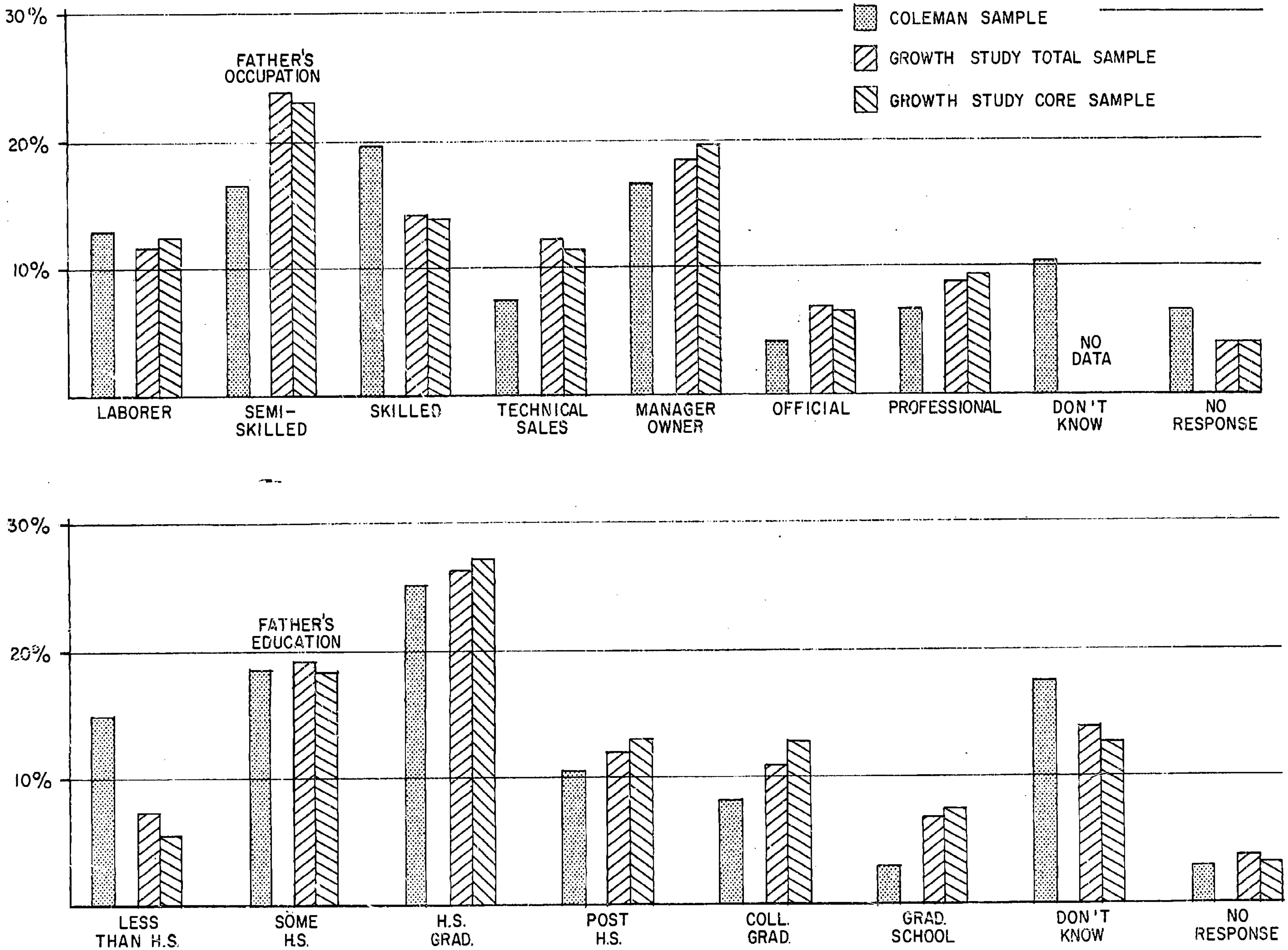

Figure 3 Comparison of Coleman Sample, and Two Growth Samples of U.S. Ninth Graders

under-represented at the low end of the SES scales and slightly over-represented at the high end. It appears, nevertheless, that the Growth Study sample can be regarded as approximately representative of American schools.

Data and Instrumentation. The original and continuing focus of the Growth Study was on academic growth, as measured by objective tests of ability and achievement, with the recognition that this domain is but one aspect of the total development of the student. Supplementary biographical information--on interests, both academic and non-academic, and on educational and vocational plans--was obtained from questionnaires, but the primary objective remained that of thoroughly describing and explaining the student's acquisition of knowledge, understanding and intellectual skills.

The data which were available are listed in Table 1.

Each Growth Study test administration consisted of approximately 15 hours of testing which was conducted in the school by teachers and counselors who were provided with detailed manuals of instruction. The very small fraction of unusable answer sheets received suggests that the test administrators were unusually successful in conducting orderly test sessions. The schools were provided with full reports on the SCAT and STEP scores of each student, and most of the schools used these scores for guidance purposes.

The basic instruments of the study were the School and College Ability Tests (SCAT) and the Sequential Tests of Educational Progress (STEP). The SCAT, which yields verbal and quantitative scores, measures general ability to do school work. The STEP series of achievement tests measure the student's ability to apply his skills to the solution of problems in six areas: reading, writing, listening, social studies, science, and mathematics. Lower level SCAT and STEP forms are scored on the same continuous scale as higher level forms.

Scores on three tests of the College Entrance Examination Board--the Preliminary Scholastic Aptitude Test (PSAT) and two Achievement Tests (English Composition and American History)--provided data on the student's senior-year aptitude and achievement.

The Test of General Information (TGI) was designed especially for the Growth Study in order to identify non-academic factors that are related to students' growth during this period. It was used to determine when and at what rate students learn the kinds of facts that are not systematically taught in school, but which an alert and reasonably well-informed adult could be expected to know. There are three forms of this test at three different levels of difficulty with questions in each of eight areas: home arts, industrial arts, physical sciences, art and music, biological sciences, history and literature, entertainment and recreation, and public affairs.

Questionnaire. The Background and Experience Questionnaire (BEQ) was also designed especially for the Growth Study. It provides

Table 1

Summary of Data Available

Level	Variables	Instruments[1]
Grade 5	Aptitude and achievement	SCAT, STEP, TGI
	School characteristics and community SES	Principals Q.
Grade 7	Aptitude and achievement	SCAT, STEP, TGI
	School characteristics and community SES	Principals Q.
	Academic program enrolled in (If in a junior high school)	Test answer sheet
	Experience, aspirations, interests, & family background	BEQ 1
Grade 9	Aptitude and achievement	SCAT, STEP, TGI
	School characteristics and community SES	Principals Q. & school visits
	Academic program enrolled in	Test answer sheet
	Experiences, aspirations, interests, & family background	BEQ 2
Grade 11	Aptitude and achievement	SCAT, STEP, TGI
	School characteristics and community SES	Principals Q.
	Academic program enrolled in	Test answer sheet
	Experiences, aspirations, interests, & family background	BEQ 3
Grade 12	Aptitude and achievement	PSAT, CEEB tests
	Complete high school record	Transcripts
	Vocational plans	Q. on answer sheet Biography in yearbooks
Summer after high school graduation	Rank in class	Roster to school
Fall after graduation	Post-graduate occupation (Education or vocation)	Questionnaire to school (1st follow up)
2nd year after graduation	Occupation	Questionnaire to individual (2nd follow up)

[1]All abbreviations are explained in the glossary in the appendix.

information on the relationships between the student's growth and his experiences and activities in and out of school. This questionnaire attempts to minimize generalization and vagueness by requiring the student to document many of his responses with facts, such as the titles of some books he has read, the plays he has seen or participated in, the instrument he plays in the school band, or a description of the job he has held during the summer. The questionnaire also yields information on the student's opinion of the courses he has taken, and asks the student to indicate how often and with whom he has discussed topics such as his future education and career plans, news events of the day, or personal values. The same instrument also provides data on the education and occupations of the student's parents and the amount of encouragement and support they give him. Forms of the Background and Experience Questionnaire were developed for the seventh, ninth, and eleventh grades.

<u>Literature Search and Interviews</u>. The first step of the investigation, following the necessary staffing and planning, was to expand the search of the literature and theoretical analysis begun in the summer of 1965 in preparation for the present research.

During the same time period, a number of the 17 school systems participating in the Growth Study were visited with two purposes: (1) to survey the status of vocational education at each school and (2) to interview at each school a small randomly selected sample of students in regard to the state of their career decision-making. The interviews were recorded, although their content was not analyzed in a formal way. The interviews were used (1) to provide the research staff with firsthand acquaintance with the thoughts and feelings of the subjects, (2) to obtain information on the nature and timing of vocational choices in the actual school setting, and (3) to suggest variables and processes which should be incorporated in the theory of vocational development, the development of which stands as a fifth objective of the investigation.

Chapter 3

Strategies for Vocational Research: A Summary of a Discussion[1]

All research grows out of a background of discussion that is seldom recorded. This is unfortunate, for the discussions generally probe a rich universe of possibility out of which the final study must, of necessity, select only a few atoms. This chapter is a condensation of such a probe of a considerable range of pressing issues in vocational development. Specifically, it is a summary, with extensive direct quoting from the transcript, of two days of discussions by the staff and advisors to the Vocational Development Study, January 15 and 16, 1968, at Educational Testing Service, Princeton, New Jersey. In general, explanations of studies that are covered elsewhere in project literature have been cut to only a few words to allow room for expansion on themes of general interest.

This summary is presented here as an introduction to the methodological and substantive issues faced by the research staff in conducting the Vocational Development Study. (These issues also are faced by the whole field of educational research.) The points made in the discussion highly influenced the design of the various studies conducted as part of the Project.

Speaking during the proceedings were the following advisors: William E. Coffman, then Acting Director, Developmental Research, ETS; Bruce Eckland, Sociologist, University of North Carolina; Norman Frederiksen, Director, Division of Psychological Studies, ETS; Edward Landy, Assistant Superintendent and Director of Counseling Services, Newton, Massachusetts Public Schools; Roger Myers, Associate Professor of Psychology and Education, Teachers College of Columbia University; W. Benton Schrader, Senior Research Psychologist, Test Program and Statistics, ETS; and Benjamim Shimberg, Director, Vocational-Technical Education Projects, ETS. Staff members speaking (in order of their appearance) were: Thomas L. Hilton, Project Director; Martin Katz, Associate Project Director; Donald Rock, Lila Norris, Michael Patton, Norman Freeberg, Michael Rosenfeld, Franklin Evans, Patricia Casserly, and William Godwin.

Among the matters explored in this summary are: intervention effects on research design, p. 3; prediction and student decision-making, p. 4; a critique of prediction models, p. 5; the issues of status and separation, p. 6; freedom of choice and prediction models, p. 7; decision versus drift, p. 8; freedom of choice and education in a democracy, p. 9; a vocational choice model, p. 11; the need for case studies, p. 13; the problem of washing out differences, p. 13; teacher and curricular effects, p. 14; predicting what might have been, p. 15; multiple regression versus moderated prediction, p. 16; follow-up studies, p. 17; the problem of criteria, p. 19; the pursuit of dropouts, p. 20; the relevance of settings: the school, the community, and the nation, p. 22; efforts to develop a vocational choice model, p. 27; the computer in vocational development, p. 29; and a closing exercise in path analysis, p. 33.

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[1]This chapter is largely the work of David E. Loye who recorded and extensively edited the discussion on which it is based.

Intervention Effects on Research Design

In getting the discussion under way, the problem of intervention effects was raised by Landy. The Vocational Development Study, he noted, "depends upon getting data about youngsters as they pass through existing schools and existing experiences. Is there a danger here of crystallizing the status quo? Also, how does one allow for the possibility of intervention to effect change?" What if, in some school furnishing Growth Study data, a Martin Deutsch, a Jonathan Kozol or a Herbert Kohl were at work exciting slum children about learning so that their futures might be radically changed from the normal expectation (Deutsch, 1967; Kohl, 1967; Kozol, 1967)? How would this affect the prediction model the project seeks to develop?

Possibly one attack would be to "look closely at a number of schools, identify differences in output, and go back and see what lay behind it," Coffman suggested, noting that besides classroom and single school effects, a gifted administrator might be implementing changes affecting a whole system. He also felt that much that is effective results from "exposing children to a lot of different teachers and different settings and sometimes something clicks. I doubt if a single model will be appropriate. More likely we'll need a complex set of models depending on some subclassification of individuals."

Eckland felt the matter of intervention was mainly a problem of controls in the research designs and being wary in drawing conclusions. The Growth Study purpose, Hilton then suggested, should put the matter in perspective. "To our knowledge there's never been a study involving a nation-wide sample that has taken a group of students early in their careers and followed them for nine years, as we will have by the time we're finished. Our general point of view has been that there is a need for base line data about student development. To a large extent we <u>are</u> documenting the status quo. But as to the danger of our crystallizing the status quo, I would argue that we're trying to provide a base line from which departures from the status quo may be detected--a base line we can identify in the schools, so that the effect of interesting departures may be studied empirically."

It was also noted by Landy and Myers that when one considered the present state of affairs in American education, the probability of interventions affecting the data was, unfortunately, quite slim. Herbert Kohl, Myers noted, had quit in disgust after a year of exciting work in slum schools and had subsequently observed that "the kids went back to their same old way of doing things."

Prediction and Student Decision-Making

To clearly see the problem of constructing prediction models, one must return to the beginning of the school process, Katz offered. "It is helpful to think in terms of stages of vocational development--to search for events at one time that are relevant to vocational development at some later time." It seemed to Katz that it might be good to discover a school devoting attention in the early grades to student decision-making--"that is, to giving the students the notion that they are competent people who can [illegible] choices, can act on those choices, can get feedback from those choices, can evaluate the results of their choices, and can use this information in later choices." He told of an experience working with Philadelphia schools on planning a career development project that could give pupils structured experiences in individual decision-making as early as the first grade and on into high school. "These experiences can help develop a sense of agency and decision-making skills. At an appropriate stage information about the world of work and about educational options would enter. Students who had been through this sort of experience would be expected to emerge with a greater capacity for making informed and rational decisions than students who had not been through this experience."

Critique of Prediction Model

Eckland asked what was meant by "prediction model." He hoped it didn't mean merely "the situation where a host of demographic or behavioral items are thrown into a battery, and sophisticated statistical methods are used to see which items may hang together, but without any idea in a longitudinal or developmental sense of what the causal nexus might be. It seems to me that unless we take an approach that deals with causality--with causal inferences and with models that deal with causal inferences--one doesn't get very far in this business."

An even more fundamental danger, Shimberg felt, was the use of the prediction model as a self-fulfilling prophecy. "We describe what's likely to happen, and usually it happens that way because we make it happen or we let it happen. In the best of all possible worlds, the tester would say: This youngster is very poor in numerical skills, he's going to have trouble in mathematics unless we do something about it. So let's do something. Instead, we say: He's going to have trouble in math, and sure enough, he goes ahead and has trouble in math. Then we say, Look, how bright we are. We predicted this youngster was going to have trouble in math and he did."

Eckland felt causal inference models might remedy this situation, and that Growth Study data, being longitudinal, were of the greatest importance to those interested in developing causal inference models. "The primary stumbling block with causal models is the problem of sorting out the time dimension in which the action takes place. Getting the precise temporal ordering of the variables is mandatory in order to study their interaction. You can only do this through repeated observations, and this is what is so appealing about the Growth Study data. It does have repeated measurements by which you can, with a fair degree of confidence, put the variables you're dealing with into a meaningful sequence." Rock explained that this avenue would, in fact, be explored through path analysis of Growth Study data, as part of the study. The basic question being asked was if this student or that student was in a different treatment, or program, what different outcomes might result?

The Issues of Status and Separation

Another basic issue that should be discussed, Eckland felt, was the status problem of vocational education--"how it is seen by others within the value system of a high school, and within the community, and the problems that this status problem presents for vocational education in competition usually with an academic program." There were, for example, some indications that vocational education should be carried on apart from an academic program, especially at the junior college level. When vocational education was integrated within a community college, with free tuition and an open system, the prestige of the more dominant academic orientation for students seemed to undermine the effectiveness of the vocational education program.

Was he suggesting examining whether vocational education is different if conducted in a separate vocational school than in a comprehensive school? Coffman asked. How might this concern relate to the choice process, Landy wondered. His concern, Eckland explained, was not with process *per se*, but with "whether enough attention is being paid to the structure of opportunities within which the choices are made." Shimberg agreed the opportunities existing in the school situation could be critical. "More and more people are reaching the conclusion that it is not vocational education that is the dumping ground in our educational system, but that it is the general education curriculum. You can see the effects--the general curriculum students cease to progress academically because they can find no purpose in their studies--no real stimulation--as compared to youngsters in vocational programs who are generally more highly motivated and goal directed."

Freedom of Choice and Prediction Models

Discussion then centered on the question of the individual's freedom of choice--"to what extent these choices are structured for him, as against the kind of opportunities he has for changing his condition," as Eckland put it. Or as Katz expanded in paraphrase: "to what extent the individual is given an opportunity to be a strategist in his own decision-making, and to exercise some freedom of choice according to his own perceptions of what is desirable; as opposed to a structure that perhaps insidiously and surreptitiously predetermines what his choice is going to be. And not only predetermines *what*, but even *how* his choices will be made."

Strictly from the scientific point of view, Eckland felt it was difficult to speak of free choice. From the point of view of the social scientist, one had to make the highly deterministic assumption that *everything* could be predicted if one had the right grasp of the situation. "But from the viewpoint of counseling, it's very important, I think, to develop a model in which you are assuming that the individual is capable of some degree of free choice."

Coffman felt this moved the study into central focus: "to find out how much we can understand by asking how much we can predict. The ultimate goal of this and a succession of other studies over the next thousand years is perfect prediction. But mainly for the purpose of understanding, and only secondarily for the purpose of managing. This is the danger of the prediction model--the danger of the word itself. The danger is that at some point along the line you forget that when you planned it you were really seeking understanding--that you don't have, in the model, something sacrosanct and foolproof."

Decision Versus Drift

An allied concern, Eckland felt, was the danger of assuming that lives were determined by a rational decision-making process based on the individual's response to a clear-cut "crisis"--"the kind of situation where one is presented with a number of alternatives and a decision has to be made on December 21st. Life isn't like that, for the most part. Life to a very large extent is a process of drift. One drifts into situations where the decisions to a large extent are unconscious and the result of small incremental changes."

Taking issue with Eckland's attack on the rationality of individual decision-making, Mrs. Norris outlined an experimental methodology developed by Gerry Halpern and herself that might be used to investigate the question (Halpern & Norris, 1968). "If you provide them with the probabilities of attainments in the various curricula, and the type of information they need to formulate strategy, and then have them make a choice, you could see just how rational the decision is. How <u>are</u> they weighting the various elements that go into making the decision? What sort of strategy <u>are</u> they following?"

Eckland agreed the approach could be valuable, but explained his concern was that "sufficient attention be given to determining the structural variables that limit the alternatives for the individual." If this was the case, Patton wondered, why go in with the <u>a priori</u> kind of explanatory model Eckland felt was needed: "Don't you think we should be more inductive?" There were certain kinds of assumptions one had to make even in using the inductive approach, Eckland noted. "These assumptions determine, for example, the kind of variables that you will select from the environment to look at. There has to be some combination of both deductive and inductive approaches."

Freedom of Choice and Education in a Democracy

Katz then took issue with Eckland on the questions of freedom of choice, decision by the individual, and whether there were notable decision points as opposed to a process of drift. "I would suggest that one of the most distinctive features of our culture is its emphasis on choice. Moreover, not only do we tend to find opportunities for choice as individuals, but as a society we impose requirements for choice, and this is very strongly tied to the whole notion of individual freedom and other universals in the American ideology. So great is this ideological requirement that we even artificially establish requirements for choice when none might be needed. For instance, in school there are choices that are not really necessary, that don't have to be made at a given point, and yet we encourage students to face alternatives and options and choose between them because we're convinced that there is some developmental importance in learning to choose. This is somehow wrapped up with the whole notion of a democratic society that elects its officials--choice again; and so we believe that people need training and education and developmental experience in choosing. And we almost deliberately introduce what Tiedeman and O'Hara (1963) call 'discontinuity periods,' in which you are aware of a certain state in which you presently exist, and you are aware of a new state of affairs with some options inherent in it, and then somehow you must decide which of these options is most desirable from various points of view, and you must then move from where you are to where you want to be under the new set of circumstances." The whole guidance movement, Katz felt, was based on this assumption.

Freeberg took Eckland's position, questioning whether this really occurred. Landy felt the truth lay somewhere in between, and that the issue was to what extent students were being made aware of the fact that they were making choices and could bring to bear rational processes on these choices, or to what extent the choice was forced upon them-- "and to what extent they drift into a choice, in Bruce's terms. To what extent is the structure of the institution in which the youngster operates obvious? For example, a student in a small high school that has no vocational curriculum at all, just by the nature of the structure of the institution, cannot make the choice for vocational education. I think what you're stating, Katz, is a position we should aim for and try to create. It exists to some extent here and there, but how universal it is, I don't know."

"Would you agree that there is a kind of universal ideal of rational decision-making, even though this ideal is often violated in practice?" Katz asked.

"It is given more lip service than real service," Landy ventured. "For example, it may be nothing so obvious as the counselor telling the youngster exactly what to do, or the principal saying you must go here rather than there. The counselor says to the youngster, 'Here are some choices, it's up to you.' But, in fact, the choice is determined by the youngster's own set of values, the effect of the institution, the family values, the values of his peer group--all these things bear on him. We have a vocational high school in our town--or we did until we incorporated it and made it part of the comprehensive high school--to which many of our counselors felt some students ought to go. But the youngsters chose not to go there. They wanted the general curriculum because it was demeaning in status to go to the vocational school in our community, which is largely a college bound community. You have this kind of problem, and even when you attempt to reason with the youngster, other things still are so powerful they prevent reasoning from taking place. Until and unless right from grade one on we can somehow inculcate in youngsters the necessity for examining choices in a rational way, we will still have not necessarily irrational but nonrational decisions at points of discontinuity."

A Vocational Choice Model

Mrs. Norris summarized a study by Gerald Halpern and herself of the way students acquire and use information in making a vocational choice (Halpern & Norris, 1968). This prompted these thoughts by Katz about possible mathematical weightings and relationships for a vocational choice model. "I think that we should be concerned with the situation as a student perceives it--that is, he can make choices and these choices are related in some way to what he wants, his desires, his values, specific things he wants to attain. I've been working on a model that attempts to capitalize on this notion using three systems, a value system, an information system and a prediction system. We have him explore and scale his values by a very simple process. Then we look at the options--to what extent will each option give him the satisfactions he seeks in respect to each value? We then multiply instrumentality times strength of value to obtain a product and add up these products for each option. Then we can look at the prediction system and ask: What are his chances of attaining this option? Conceivably we can come out with a decimal that represents his chances. Multiplying this by the sum of the products for each option will give us some index of the combined subjective utility and objective probability of each option for this individual. And this should enable him to rank order the options in a very rational way--assuming that rationality is possible in dealing with choices."

By recycling through this process, Katz explained, the student could try out several possibilities. This model of the vocational choice process emphasizes this essential difference from the usual approach: rather than simply presenting the student with an array of options, as in most counseling, his values are first identified, and then the options related to the values. "One thing we'd like to examine closely would be individual differences. Do some individuals make use of a rich and detailed array of values, while others draw on a rather sparse and penurious array? And is the content of this array related to background data? Is it predictable? This again gets us into the question of the degree to which choice involves free will or determinism. Can we predict what his values will be from elements in the background data? I suspect we might get a few rather modest predictive items, but I wouldn't expect to get any great strength of prediction."

The Need for Case Studies

Landy felt these thoughts suggested the need for case studies of individuals within the research design. He noted Piaget and Skinner as examples of important theorists who based their work on small samples. Individual case studies, he felt, could give clues for larger investigations. Myers also noted the need to use such "real life" referents as a source of subjects for testing theoretical models to prevent the proliferating simplification which can afflict models that are not repeatedly checked against reality. "A half dozen very intensive case studies, including studies of family background, interviews with parents and so forth, to get as thorough a picture of a few individuals as you possibly can" would be a good idea for the next stage of the study, Landy felt.

The Problem of Washing Out Differences

A study by Patton and Morse (1967) of differences in Growth Study students' aptitude and achievement from the fifth through eleventh grades was summarized by Patton.

In the discussion of follow-up study plans, Schrader questioned whether the multivariate analysis design proposed was preferable to a single-dimensional approach using SCAT or STEP scores as a dependent variable and comparing early and later regression lines. "I think the idea of putting this whole thing through a big wringer to see what comes out doesn't fit with what Bruce [Eckland] was saying." Eckland agreed, questioning whether curriculum and school differences might not wash out one another. Shimberg was also concerned about the possibility of losing important differences. He felt that whether or not one could predict a student's progress might be a measure of whether the school was any good. "In schools where behavior subsequent to the fifth grade was clearly predictable, you could entertain the hypothesis the school wasn't really doing very much for the kids. And where you couldn't predict, this might indicate that a successful intervention had taken place. If you pool your data, you'd know that you do or don't have a good prediction model, without knowing what's happening in the individual schools."

Patton agreed it was a concern needing to be cared for in the design. A problem, however, was that "at present the only measure approximating a measure of school quality is the SES level of the students attending the school." Hilton and Patton then explained the multivariate method that would probably be used would seek first to find significant main effects for schools, then examine other variables (curriculum, sex, SES) based on whether or not significant school effects had been found.

Teacher and Curricular Effects

"To what extent will you be able to tackle the question that differences are the result of self-fulfilling prophecies?" Landy queried. Early in the sequence you labeled some youngsters academic and some non-academic, he noted, and later those labeled academic did better on academic tests. "The teachers think they're better. They have higher standards for these youngsters, and they teach them more rigorously and vigorously."

This effect of teacher expectation had been compellingly documented by Robert Rosenthal (1966), Patton noted. The impact of the two different curricula also seemed an important influence accounting for the gap, Landy felt. Still another possible influence, Shimberg noted, was sectioning for homogeneous groupings, "where the poorer kids get put in the lower section and get essentially a more impoverished treatment, a sort of maintenance rather than a demanding treatment. This could account for the spread."

Regarding these differences, Patton noted that within the Growth Study sample there were great differences in the average performance of vocational students in different schools. Landy felt this was not uncommon in schools, one cause being the uncommon or specially motivated teacher.

"You get a department head, say in mathematics, who is very anxious about the reputation his kids create for him on College Board scores. He becomes finicky in admitting youngsters to his eleventh and twelfth grade mathematics programs." And Shimberg noted an instance in one high school, where "the people in the business education department are very fussy about which girls they'll let into the business education program. Some of the kids who need it most, the average, even below-average students who could make good clerks or typists, are not permitted in because of the image problem."

For these and many other reasons, Hilton noted, an outcome of Phase I of the study was the conviction that considerably more had to be known about the individual schools, and this was to be primarily Mrs. Casserly's concern.

Predicting What Might Have Been

A method of evaluating whether or not a student was in the best possible program for his particular unique set of capabilities--and whether or not such a program was presently available to him--was explained by Rock.

One hope, Rock explained, was that the approach might solve a seemingly unsolvable classification problem. "If you want to know if a fellow's going to become a good machinist and he's a psychologist, you have to let him be a machinist for a while to really find out. Of course we can't do that. But this is an approximate solution to this problem."

The method, essentially, would compare matrices of background and behavioral variables with matrices of predictor and criterion variables, working in actual practice somewhat like this. "Let's say we have a compulsivity factor from the biographical information. This is a hard-working individual, he studies every night and does all the things he's supposed to do. If we look at his background we may find that he's middle-class SES, and other factors may indicate he's a success character. We don't worry too much about him. But then we have a fellow over here who is low in compulsivity, low in SES, and his profile on other background variables may be quite different from the success character. Well, maybe we'll find a success group in some other curriculum that has a profile very much like his. Then we might be able to say that this person, if he had started in this curriculum, might have done better than he did."

Multiple Regression Versus Moderated Prediction

The method, Rock felt, might also answer the question of how early one might predict a student's choice of program or vocation--not necessarily success in that choice, but the choice itself. This might be as early as fifth grade. Then he criticized both the use of multiple-regression analyses and the idea of hypothesis-testing versus plunging into the data to see what correlates. Of conventional multiple regression analyses: "they should have stopped it 10 years ago." He preferred "a moderated prediction model, where I can group people multidimensionally on background variables. . . . There are other ways of forming taxonomies than the analysis of variance of known groups. Group people in multidimensional space, then do your statistical analysis. Instead of starting with known groups of, for example, boys or girls, I think more work should be done in finding people similar on a lot of dimensions instead of one or maybe two at a time. Let your computer do your taxonomy for you. That's what it's for." Of hypothesis-testing: "I think this business of using the computer to search for things works better than hypothesizing beforehand. You just have too many variables to contend with in hypothesizing. You can use the computer to cut them down to size."

Discussion centered on how the approach might be related to the problem of differences among schools. Landy felt it would be interesting to see whether students with the same set of background characteristics as measured by the BEQ would turn out differently in different schools. "The Coleman Report (Coleman, et al., 1966) suggests they don't," he noted, and remarked that this led to such interpretations as the one that it made no difference to put Negro children in better schools unless they were integrated. Hilton felt the question might be answered because race was known for students in several Growth Study schools. As for the BEQ as a predictor, however, Hilton described a study using Growth Study data that cast doubt on the notion that SES level and other background variables had high predictive value for high school students (Hilton & Myers, 1967). This was an encouraging finding, Landy noted, suggesting that the individual could overcome the background, or that interventions did make differences.

Follow-up Studies

The crucial problem of relating what happens to students during school years to their actual vocations in later life was probed in detail following a presentation by Hilton of past (Rothenberg, Klein, & Morse, 1967) and future prospects for follow-up studies.

A tentative decision, Hilton explained, was to concentrate on those in the Growth Study sample who had graduated in June of 1965. They would now have been out of school three years. With the boys, probably one-third would be in military service, one-third in four-year colleges, another portion would have completed two years of a junior college and be employed, and another portion would be in various vocations. Eckland was concerned about whether the follow-up study would be taking "simply the graduates or are you going back and starting with the original ninth grade sample? Obviously you're going to miss a lot of people if you take the high school seniors only, because there's going to be a lot of attrition between the ninth and the eleventh grades, with people entering the labor market or perhaps going into some kind of vocational technical programs outside of the high school."

This was a serious problem that must be remedied, Hilton agreed, as they did lose 15 percent of the sample between the ninth and eleventh grade groups. Continuing his critique, Eckland felt three years after high school was an awkward time for follow-up studies--it was right in the middle of the time people were making decisions; for example, women, about marriage. He felt that a series of follow-ups over 10 years would be better. Schrader agreed, but noted the best time for the first follow-up was soon after graduation, as the high schools could furnish very good data on recent graduates, whereas after two years "everything gets very cold."

Shimberg then noted that this general problem area was so important, and yet so difficult, that he felt the best one could hope for "between now and August" was a few exploratory studies, and then go on to the "big follow-up" later. "One of the really hot issues in the field of vocational education is this need for a dependable, reliable method of following up the graduates of occupational programs to know where they land, and how long they stay, and how satisfactory they are to their employers. I think the same thing is true of people who graduate in academic programs. The counselors know that certain students went to certain colleges, but they seldom know their survival rate."

The Problem of Criteria

Freeberg was hopeful suitable criteria would emerge from the follow-up studies--some measure of "vocational maturity," for example. What did the term mean, Eckland wanted to know. He noted that a Carnegie funded study asking this question had produced a great list of objectives but no single clear answer. Rosenfeld suggested "vocational satisfaction" might be a better term. Shimberg suggested that vocational maturity was a matter of style of decision-making. Myers noted that another study had shown that whatever vocational maturity was, it wasn't the same for ninth and for twelfth grade boys.

The chances of the project resolving the meaning of "vocational maturity" were slim, Hilton noted; however, the discussion did suggest the practicality of not being too ambitious at this point in the follow-up studies. He felt it would be wise to follow Shimberg's suggestion and limit the effort to a few exploratory studies, possibly even confining the probe to the excellent data the Oakland public schools already had on 1965 graduates. To this one might add locating and questioning Growth Study schools' 1967 graduates. One might also compare the occupations seniors aspired to last June with their actual present occupations for some measure of realism of aspiration.

Landy questioned this idea as not taking "the changing society in which kids go" into account. "It's conceivable a choice may be realistic in the twelfth grade and not one year later because of purely extraneous factors--a dip in employment, or peace is declared and an airplane factory closes down, and so on."

The Pursuit of Dropouts

Trying to find a good way to study dropouts using Growth Study data was a frustrating problem, Evans reported.

He had discarded the idea of following a Growth Study dropout subsample as being too expensive, and the idea of a study of dropout antecedents as having already been done extensively by others. This left him with the idea of comparing intellectual growth patterns for dropouts with those for continuing students, but then he had run into the problem of the child tested in the fifth grade who falls behind a grade and is not tested again in the seventh or the ninth grades--in effect, dropping out of the sample.

"You have no faith in our educational system," Shimberg noted. "We practice automatic promotion."

Not according to the literature, Evans suggested. At least it "seems to show that people who drop out of school tend to fail during the first two grades or somewhere around the seventh grade." Even so, Landy said, there was much automatic promotion, warranting use of the data. Evans then explained how he planned a study of dropouts using Erie public school data. He would find the dropouts by progressively narrowing the search among those tested in the fifth grade who do not reappear in the eleventh grade testing. Why Erie? Shimberg asked. Why not Oakland? Because Erie offered a special advantage: Akron schools had SES similarities to Erie that made possible some interesting comparisons. "If we can build a prediction model in Erie, will it apply to Akron? Can we take an equation based on the Erie public schools and apply it to the Akron public schools and get the same kind of prediction? Will it hold up in this kind of cross-validation? If not, is the school intervening? And how do schools differ? How do the communities differ? This may not all be done in this phase of the study, but it's something that certainly should be carried on."

A stable characteristic one might find with the eventual dropout would be no gains in achievement testing through grades five, seven, and nine, Shimberg suggested. "In other words, they're not learning anything." Evans identified this as a hypothesis he was using. Another was that the dropouts were not "getting any encouragement, no positive feedback, and so they're dropping out." He also noted that a Department of Labor study showed that something like 84 percent of the dropouts were retarded by one grade, and that roughly two-thirds of this figure were retarded two grades.

However one gathered the data, it seemed extremely important to Eckland to get information on those who had dropped from the sample, "not only from the standpoint of studying the group itself, but also for the implications these data may have for the findings on those who remain in the system." He noted that one finding over a period of time was a greater standard deviation as one moved from the fifth through the twelfth grade. "One begins to wonder how much that greater dispersion may result from the impact of the dropout of certain individuals from the system. Students who scored in the next to the lowest percentiles in the fifth grade and remained in school through the twelfth grade may now be scoring in the lowest percentile because those previously at the very bottom dropped out of the system. Suddenly the dropouts are gone and the youngsters close to the bottom now see themselves actually at the bottom--and so, too, do their teachers."

Hilton noted this as a concern for the study. "It seems to me a very interesting hypothesis that a student's perception of his relative position in the class, and his relative growth, is the critical factor, and not his perception of his absolute achievements."

Of Settings: the School, the Community, and the Nation

Mrs. Casserly presented some preliminary plans for probing the matter of setting or climate with interviews. Her purpose would be to identify factors in the school or the community that might account for "the results we are getting, not only in the test scores, but also in the feelings of the students about entering various programs, and their expectation of success in them."

One of the main things she hoped to find was how much self-selection was involved. "We're back to Marty Katz and the free will question--how much self-selection there is, or how much selection is determined by the counselors or teachers or by influences from outside school, from the home and the community."

A number of suggestions for adding to her proposed questions for interviews were offered. Landy felt it was important to look for evidence of unusual, innovative programs, in instruction or guidance. "For example, we vacated a small elementary school building, the high school was overcrowded, and we asked some youngsters and some teachers if they wanted to volunteer to go to this separate building and, in a sense, be as 'way out' as they wanted to be. And indeed they have--about 125 youngsters and their faculty work together in setting their own rules, and they deliberately avoid having any kind of administrator. Whether it'll be complete chaos at the end of the year as it started out, I don't know, but it gives us a chance to try something new." Landy also felt the schools should be queried as to what use they were making of ETS tests, such as SCAT and STEP, for counseling purposes.

Katz suggested evidence of vocational orientation programs as something to look for. Rosenfeld suggested the school's role in placement was important. Patton felt atmosphere should be noted, mentioning that he and Evans had visited a school that gave one a definite feeling of "we are ladies and gentlemen and we act like it all day long and if we don't we get clobbered." Katz raised the question of using a formal instrument in addition to interviews--something on the order of, for example, the attempt to "adapt Pace and Stern's college characteristics index to high school use." Shimberg felt that perhaps attention should be given to critiques of the Coleman Report, so that this study might avoid some of its pitfalls.

"If we're going to draw inferences on a relationship between school characteristics and achievement, I think it might be worth looking at what Levin and other critics of the Coleman Report say. For example, the school expenditure figures were apparently arrived at simply by taking the total budget for the school system and dividing it by the number of students in the system, and assuming that financial resources were being allocated across schools evenly. It tends to give a distorted picture for slum schools. There are a number of such methodological points raised here and it seems to me that if the only way to get this data is by being in the school and asking about it, this might be a good time to do it."

Patton hoped that interviews with counselors would elicit recent specific case histories as well as general information. Katz suggested asking each counselor for one case with which he felt he'd been successful, and another with which the counselor felt he's been unsuccessful. Patton noted the latter might prove difficult to obtain because of the sometimes fantastic investment in schools in maintaining a success stance or front.

Eckland then raised the question of how this particular probe was to be seen within the perspective of the crucial relation of vocational education to the organizational structure within which the vocational education was provided--that is, the structural requirements of the community, the nation, and the national purpose.

"We are faced with all kinds of problems in most urban communities, especially problems that relate to *de facto* segregation, whether of race or of class. We have problems of certain kinds of inequities in the schools that derive from the social organization of the community, and this may really have nothing to do with the school *per se*, but is reflected in the school as a consequence of these external conditions. We also have a number of opportunities to deal with these problems. Increasingly there is experimentation with different kinds of organizational structures for schools. We're talking about educational parks and so forth, and some of these innovations very likely will come about. So it seems to me that we need to consider what of really crucial importance is involved in these innovations. One of these key issues comes out in Conant's (1959) writing on the American high school--the stance, for example, that he has taken regarding the notion of the comprehensive high school as being a democratized experience, one within which you bring together a great deal of heterogeneity, students from all kinds of cultural backgrounds who hopefully will interact on some basis within the context of the school, and will thereby become better citizens, better future leaders."

"However," Eckland continued, "there is much evidence that suggests that this just doesn't work--that within the context of the school the stratification and the structure of the adult community is carried over pretty much as is into the high school. We find this has developed within the system of tracking, and within separate curricula for vocational and academic programs, and so my feeling is that you should especially seek to grasp the kinds of attitudes that students hold toward students within other curricula. Ideally, one could have some kind of sociometric design and see what the social status structure of the adolescent actually is within the school, and see what kinds of social cleavages and how much social distance there might in fact be between these kids in the various curricula."

Frederiksen ventured that he didn't doubt the value of such a study, but wasn't entirely sure how it might relate to Casserly's interviews, which were perhaps in danger of becoming "all things to all men."

Casserly felt the concern could be fitted within the purpose of relating school setting to community setting. Katz could see it was "tremendously important--that is, the extent of segregation or isolation between those in the vocational curriculum and those in the academic curriculum. This might be a more critical dimension to examine than simply whether a student is in one or the other curriculum. That is, is he in a vocational curriculum in a school where the vocational students are the goats and the others are the sheep, or is he in a school where they go together?" He felt that a technique used by Newcomb for measuring the probability of a student in one curriculum encountering a student in another might be worth investigating. Or within the questionnaire approach, questions determining the intermixing in extracurricular activities such as debating or dramatic clubs would be relevant. Questions of this nature relating to student government and the mix of parents in the PTA were part of her planning, Casserly said.

Katz noted the home room as one such mixing point. For Eckland this was "the only thing I can find in Conant's writing that gives any legitimacy to his argument for a comprehensive high school, the only mechanism within the structure of the school where he indicates this mixing might take place, and none of us really expects this is going to solve the problem of gaining meaningful contacts--contacts in which some meaningful interaction between students takes place." One might also find, however, that in communities that emphasize athletics, the chances for a vocational student to star in schools were bettered, and Katz noted there might well be schools where "the athletic domain is the vocational students' domain and the academic domain is the other students' domain." Rosenfeld suggested teacher interaction might also be worth looking at: "Do the vocational teachers talk to the academic teachers in a comprehensive high school? Again, it could be some indication of the climate of the school and the quality of the various programs."

In his own experience with the vocational vs. the comprehensive high school, Shimberg said he had found that the comprehensive high school as envisaged was "very, very hard to find. People will have a vocational program and an academic program under the same administration but they might as well be in two different parts of town for the amount of interaction there is between the two. Students are block scheduled and all the vocational students take their work together. The faculty is also separate because they don't feel very comfortable with the academic people. You really have different societies. I think Conant was being pretty idealistic in his description of vocational schools. At least, I haven't seen many schools of the type he talks about."

Landy felt the most important closing point was not to be bound by "existing frameworks of thinking, which keep us limited. The effects upon youngsters are often not to be found in what we might commonly posit as hypotheses, but in general climates and relationships and things of this sort."

Toward a Vocational Choice Model

Godwin explained the project on which he and Hilton would concentrate-- the development of a model of the vocational choice process (Godwin & Hilton, 1967).

The study was under way at one of the Growth Study schools. The purpose, he explained, would be to develop for several schools "an explicit diagram of how the counseling system works, a flow diagram with the choice points identified--not only the choice points that the school says exist, but the choice points that seem to exist in actuality." To give a better sense of the purpose and value of a model, Hilton then explained how the project had arisen. Two years ago he and an assistant had spent two days in one school following guidance counselors about, sitting in on their interviews with students, and generally becoming acquainted with the vocational choice process as it appeared to be working through students and counselors in this one school. Then Hilton took a print-out of SCAT scores of the students at the seventh grade level and some limited background information and using certain simple decision rules hypothetically assigned students to academic vs. general vs. vocational curricula.

He then compared his predictions with the actual assignments, and two things loomed rather large. First, "that if a student's parents were of high status, that student in this particular school had a very high probability of ending up in the college preparatory program. And the aptitude scores really didn't seem to make much difference, within certain broad limits." Secondly, "in trying to trace the chain of decisions that were made, it looked as if there were certain very critical points, the most critical point being at the ninth-grade level where it was decided whether the student got assigned to college preparatory algebra or whether he got assigned to general mathematics. And although the counselors asserted that there was flexibility here--that it was not an irrevocable decision--we could not find a single case where that decision was reversed, where a student got back into the college preparatory track if he had, in fact, taken general mathematics instead of algebra."

Even using quite primitive decision rules, Hilton's predictions were 85 percent accurate, so he had felt that a rigorous attempt to define the critical information and the critical decision points might provide a "basis for a useful predictive model. But I don't think that's the most important thing. I still see this effort primarily as giving us a great deal of detailed, precise information about the flow of students through the school from the seventh grade through the twelfth, and about how the process differs from one school to another."

The Computer in Vocational Development

The possibility for using the computer to make the same kind of predictions was noted by Frederiksen, who mentioned Carl Helm's program for verbal score reporting as an example of a seemingly extremely complex task that was actually handled with a fairly simple computer program. Godwin acknowledged the computerizing objective, but noted that model development was the immediate goal.

The computer possibility raised a number of important issues, Landy felt. One was this: "If the main purpose is to distribute youngsters most efficiently, so that you have a more exact matching of abilities with curriculum requirements, then I'm sure the computer can do it just as effectively as the human counselor, and probably more effectively. But if the purpose of guidance and counseling is to instill the attitudes and the sense of values in youngsters that Marty [Katz] talks about, then fundamentally you're not concerned with the most efficient matching of abilities to curriculum. Your concern is with the development of certain kinds of qualities that require that a youngster make some errors in the choice making process as he moves along, errors from which he may recover and learn from in the adjustment. This will give him capacities to build on that will be of lasting value to him after he leaves school."

Whether or not the project succeeded in developing a useful computer model was secondary, Hilton said, and certainly the difficulties were greater than one might assume. As an example, he told of his experience with a school in California after the New York school visit. Attempting to apply the crude rules devised from the New York school to the school data in California proved impossible. The apparent reason was the vast differences in regional situations, a critical factor possibly being "the presence of the junior college system in California. It changed the need for decision making, and the structure of the decisions that were made, and changed this in a drastic way."

Even though considerable differences were found, it seemed to Schrader that enough similarities would be found upon which to construct a "general description of the process which could then be used to move rapidly to an understanding of what is happening in a particular school, and the whole enterprise of checking, confirming, disconfirming, could be done rather quickly."

Shimberg then offered a comparison between the model likely to be found in most schools, and one toward which he felt that other schools should be moving. "In a situation where the choices are simply the college preparatory, or the general or business program, where there is no real vocational program, I suspect that the model you suggest is really operative, and it would operate whether a counselor intervened or not. But not long ago I visited a comprehensive high school in Miami, Florida--Miami Central--which was one of the few that seem to me to be what a comprehensive high school ought to be. A student in the tenth grade could elect to take an hour a day in one of perhaps as many as 25 different trade or technical courses, purely for exploratory purposes. He might then decide that he wanted to go into a trade program, like commercial art or into a technical curriculum, like drafting, or electronics. One thing I found interesting was that many college preparatory students elected these technology programs, not because they were going into technology, but because they saw this as an opportunity to learn something about electronics, or about computers. And vocational students were not locked into a predetermined college preparatory sequence. They could phase in and out on an exploratory basis. I think that when you've seen a number of these schools in operation, you come away with a feeling of refreshment and great possibilities. And I'm concerned that by limiting yourself to the Growth Study data--which may not include schools like this--you may miss something very vital."

Rosenfled raised the question of getting some measure of the student's perception of control over his environment--"that is, the extent to which he feels he can choose what he wants to do, as opposed to being locked in by others' choices." Eckland noted that in the Coleman study a control-over-environment measure had shown value as a predictor of student achievement. Frederiksen questioned the finding as being concurrent rather than predictively valid. "Those who are getting along well tend to feel they control their environment." This was the point he wanted to make, Eckland said, to illustrate that the student locked into an academic program and perceiving control might, in fact, have no more actual control over his environment than anyone else. Perhaps the matter might best be viewed as a symptom, Schrader suggested. "If a student has repeatedly been subjected to failure and discouragement, then he tends to develop this attitude of inability to control his environment, even though the school gives him every opportunity."

Landy said a study by Hummel (1966) of bright underachievers at Newton High School might be relevant to the control question but that he felt it was a subject in which it was easy to slip into simple but misleading explanations that overlooked the subtleties involved. "For example, these questions of control rest in the personality of the youngsters to a considerable extent. We have some kids growing up in rather permissive families with very little controls, who then ironically rush off to some hippie center complaining that they're controlled too much."

Perhaps this again indicated the need for a small number of "in-depth studies of individuals, in which one would get not just at relationships but at what the data mean to the individual," Katz suggested. "And not only with the youngsters, but with their parents, interviewing them on their child rearing practices, for example." Landy agreed, noting it as an earlier suggestion of his. "If you really want to get at this issue of vocational development in some depth, your large sample studies will provide useful but not sufficient information. The individual studies will provide the cautionary data against which your broad scale data, and your interpretations of large scale behavior, can be checked."

A Closing Exercise in Path Analysis

The conference closed with a brief exposition by Eckland of how path analysis might be used to show the interrelationships of variables over time in the study. "I was suggesting earlier that if you can fairly clearly make assumptions about the temporal ordering of events, which is likely as you are working with longitudinal data, you can plot these events in terms of some kind of causal nexus. And what path analysis does is force you to start drawing some diagrams, and to show the matrices and the direct and indirect ways by which the effects actually are mediated from one point of time to another."

He demonstrated the technique by describing a study linking school characteristics to social mobility of women by Glen Elder, a colleague of Eckland's in the sociology department of the University of North Carolina. The interrelationships of four variables were plotted:

class origin, school performance as measured by tests in the early grades and in high school, educational attainment measured by years of schooling, and social status as measured by the status ascribed to the women by their husband's occupations.

Figure 4 gives the path coefficients between variables, summarizes their relationships in terms of causality (indicated by the directions of the arrows), and illustrates how the method can capture and convey meanings that would otherwise take many pages of verbal report interlaced with statistics.

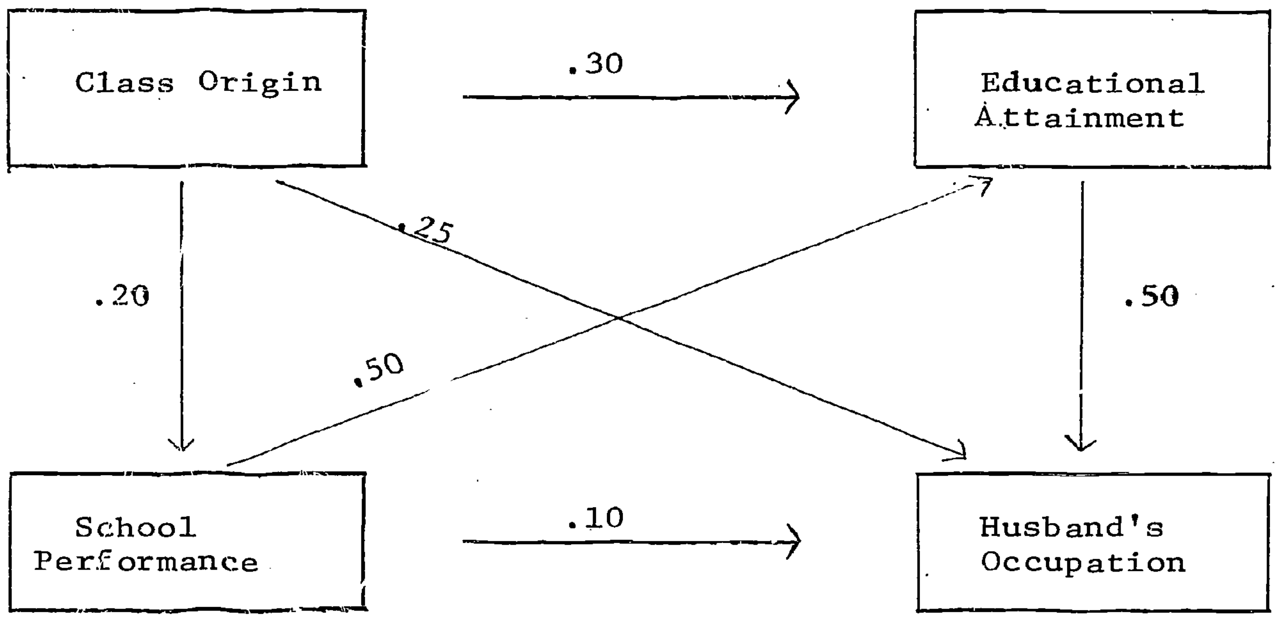

Figure 4. Illustration of Path Analysis

Conclusions

The following conclusions were generally agreed upon, either explicitly or tacitly:

1. There is a need for base line data about the development of U. S. students, but it is important to recognize that the description of status at some point in time is not a description of the way educational development inevitably must be: intervention can change the status of students.

2. Vocational development research must be longitudinal in design and be concerned with probable causes.

3. The opportunities for choice and growth which exist inside the school (e.g., specific curriculum programs) are critical. In general, the effect of school structure on the developmental process is a key issue.

4. Case studies should be included in any program of research as sources of hypotheses and as means of checking theoretical models against reality.

5. Moderated prediction models, whereby subjects are grouped multidimensionally on background variables and then analyzed, may be preferable to pooling groups of subjects into large samples for conventional regression analysis.

6. It is critical to conduct long-term follow-ups of high school graduates to investigate their successes and failures and changing values, attitudes, and occupational needs of the subjects.

7. To understand the full impact of an educational program, school drop-outs must be studied as well as those who remain in school.

In the next chapter the specific studies undertaken will be described.

Chapter 4

Outline of Studies Conducted

From the staff's consideration of various possible approaches to the research problem and also from the two-day discussion described in the previous chapter it was concluded that no single approach would be adequate. Consequently, a multi-method approach was adopted, including case studies, field studies, and several large-scale multivariate analyses.

The total investigation was initiated as a series of closely related but separate smaller studies. In Phase I of the research, which required about nine months, the emphasis was almost entirely on the development of measures and analytical techniques. Six separate studies were completed and fully reported in an interim report. In Phase II of the research, four of the six studies were continued and six new studies were initiated. Thus in Phase II a total of 10 studies were conducted. The write-ups in this final report summarize the Phase I work on the four studies which were continued. Of the two Phase I studies not continued, one has been published externally (Halpern & Norris, 1968) and will be only briefly summarized below. The status of the other Phase I study not continued will be discussed after that.

<u>The Case Development Interview Technique</u>

This technique was developed as a way of investigating the effects of certain variables on vocational planning. A team of researchers under the direction of Gerald Halpern and Lila Norris visited a sample of the 17 Growth Study school systems to obtain information concerning their vocational programs and the way in which a student selected a particular curriculum as an initial step in career planning. Interviews were conducted for small samples of students at selected schools to determine the status of their vocational planning.

A structured interviewing technique was then devised to permit systematic study of the planning process in a way which would be suitable for large samples, and not subject to the vagaries of the clinical interview. In brief, the technique asks the subject (a student) to adopt the role of a high school counselor faced with the task of selecting a curriculum for John, a fictitious student. To help him do this, he is given a table describing the kinds of information available: sealed information cards contain examples of each kind of information. The subject requests the sealed cards, by kind of information, in whatever order he wishes in order to make the required decisions. The investigators reported that not only was ability the area in which students most frequently first sought information, but also that ability remained the most frequently selected information area as a second and third choice. regardless of the first information area selected. Further, "values" was found to be the least frequently sought information area at all stages of the research procedure.

The rejection of information about values suggests a lack of awareness of what Katz (1963b) would consider a pre-potent factor, and indicates a need for education in the role of values and decision-making.

It was concluded that the technique was promising and should be applied to a substantially larger sample of high school students, and that it was important to relate individual differences and decision-making styles to other individual differences and, most important, to the subsequent educational and vocational history of the student. Unfortunately, a change of position on the part of the principal investigator precluded the continuation of this research. The technique is recommended for the investigation of factors involved in vocational planning and decision-making.

Simulation of Curriculum Assignment Process

In Phase I of the Study a pilot study of the process by which students get sorted (or sort themselves) into the various curricula was undertaken by T. L. Hilton and W. F. Godwin. In this study an effort was made to develop a series of decision rules which would simulate the process by which a student becomes identified with a certain high school curriculum. First indications, based on a pilot case study at one Growth Study school, were that at least six groups are involved in this process: teachers, members of the guidance staff, administrative officers, parents, the student himself, and his peers. The sequential decision-making takes place over a period spanning at least six years. The major curriculum assignments--some of which are made by the students themselves and, thus, are "self-assignments"--are made at the ninth grade level, but these appeared to be highly influenced by ability groupings which originate in certain judgments made by sixth grade teachers.

In Phase II it was the intention of the staff to continue this line of research. The primitive decision rules would be refined and translated into computer programs to enable computer simulation of the curriculum assignment process. This work, however, proved to be unexpectedly time-consuming and expensive (especially the computer programming) and, considering that it was not part of the original proposal, a decision was made to give priority to studies which were. A paper describing some preliminary observations about the curriculum assignment process is included in Appendix D.

Phase I Studies Continued

The Follow-up Study

Probably the major effort of Phase II was the conduct of the follow-up study which was begun in pilot form in Phase I. From the inception of the Study it was agreed that following the graduates of the various high school curricula into their post-high-school occupations was a critical aspect of the total study. This follow-up, under the direction of Jonathan R. Warren, is described in Chapter 11.

Factor Stability Study

Of major relevance to the objectives of the Study were the changing interests and values from grade 7 to grade 11 of students enrolled in various curriculum programs. A problem arises, however, when one tries to interpret observed changes: Are they attributable to true changes in the students' interests and values, or are the observed changes attributable to changes in what the scales measured at the different grade levels? The same questionnaire was administered at grade 7, grade 9, and grade 11, but the definite possibility exists that changes in the students' scores resulted from changes in the relationships among the items rather than from changes in their interests and values. To investigate this possibility, a study of the factor stability of the items was undertaken in Phase I of the research by Norman E. Freeberg and Donald A. Rock. Then, on the basis of the experience gained in Phase I, the Factor Stability Study was repeated in Phase II, using a refined technique and a longitudinal data sample as opposed to the cross-sectional sample used in the preliminary Phase I study. The results are reported in Appendix A of this report.

Moderated Stepwise Prediction System Study

As mentioned in the discussion reported in Chapter 3, an important methodological question concerns the grouping of subjects for multivariate analysis. A study of this question was begun in Phase I and was refined and applied to a larger sample in Phase II. Results are reported in Chapter 10.

Patterns of Academic Achievement by Curricular Groups

Tracing the academic growth of the major curriculum groups from grade 5 to grade 11 was a key objective of the Study. This descriptive study, parts of which will be summarized in the next chapter of this report, led to a group of hypotheses which were tested by means of multivariate analysis of variance in Phase II. Chapter 6 by Michael J. Patton describes the results.

New Studies in Phase II

Vocational Decision-Making

The first of a number of studies initiated in Phase II concerned the development of a structured interview to explore vocational decision-making. This study, led by Martin R. Katz, resulted from an examination of available instruments, which pointed to a schedule with questions designed to probe the dynamics of the subjects' decision-making. The development of the schedule is described in Appendix C.

Statistical Methods in Vocational Development

This line of research, by Charles E. Werts, was stimulated in part by the examination of academic growth reported in Chapter 6, which pointed to certain schools and certain curriculum programs which appeared superior to others in terms of the gains achieved by the students enrolled in them. The explanation of the significant differences remained a mystery, however. How do you investigate the complex interaction among all the variables which influence test performance? Conventional correlational approaches offered little promise, but recent developments in path analysis suggested a number of intriguing possibilities. A second motivation of Werts' work came from the Study's concern for vocational development. This problem is also one of investigating complex interactions. Werts' work is described in Appendix B.

Balance of Studies

Three other substudies were described in Chapter 1, in the discussion of the Study's objectives. These were the following:

(1) The School and Community as Factors in Student Achievement. Investigators: Patricia L. Casserly and William E. Coffman. Chapter 7.

(2) Negro-White Differences in Adolescent Educational Growth. Investigators: Michael Rosenfeld and Thomas L. Hilton. Chapter 8.

(3) Antecedents and Patterns of Academic Growth of School Dropouts. Investigators: Franklin R. Evans and Cathleen Patrick. Chapter 9.

Last to be mentioned, but first to be conducted and first to be reported in this volume, was a descriptive study of the curriculum programs of the schools in the Growth Study sample.

Summary and Conclusion

Thus the total study consisted of 12 substudies each conducted independently but closely coordinated with the others. Although each of the studies had a specific focus, they all had a common goal--the investigation of student vocational development--and in each special attention was paid to the curriculum identification of the student as a possible determinant of his growth.

Chapter 5

Curriculum Differences in the American High School

As an early step in the program of research described in this report, field trips were made to each of the high schools participating in the Growth Study, and at each school interviews were conducted with randomly selected students. An inevitable question was "What do you plan to do when you graduate?" and then additional questions probed for the origins of whatever plans the student described. In some large fraction of the responses a reference was made to one or more subjects taken by the student. "I liked the math courses I took so I decided to go into engineering" was a typical response. It was clear that the high school curriculum is a key ingredient in vocational development. In this chapter some descriptive aspects of U. S. high school curricula will be described, along with some speculation about the implications of the differences observed. The study relied on the Growth Study as a source of data. The distribution of the Growth Study eleventh graders by curriculum will be given, and the questionnaire and test performance of students in various curricula will be summarized. The general objective of the analyses was to detect systematic individual differences between students who identify with the various programs, and to see what implication the differences may have.

In the Background and Experience Questionnaire (BEQ) which was completed by the grade 11 students in 1967, the following question was included:

125. From the list below, which course of study are you taking in high school?

A. Academic or college preparatory
B. Agricultural
C. Business or commercial
D. General
E. Home economics
F. Vocational
G. Other*
H. Undecided

*What?____

Table 2 summarizes the responses of the students. For the total sample, 50% indicated they were in the academic course of study. This varied from 1% for the vocational high schools (That any students at all gave such a response probably resulted from a misinterpretation of the question) to 93% in the high school in West Lafayette, Indiana, the location of the University of Indiana. One-sixth were enrolled in business or commercial curricula, 1/7 in general, 1/12 in vocational programs, and the balance in assorted programs. Our observation is that in most schools the general program was a catch-all for students who chose not to take, or could not qualify for, a better defined course of study.

Table 2

Distribution of 1967 11th Graders by Curriculum and High School

	Total	Acad.		Agri.		Bus.		Gen.		Home Ec.		Voc.		Other		Undec.	
	f	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%
Cohasset	99	80	81	2	2	9	1	8	8	0	0	0	0	0	0	0	0
Academy	442	179	45	1	0	157	36	67	15	2	0	1	0	3	1	14	3
East	305	116	38	3	1	69	23	107	35	2	1	1	0	2	1	5	2
St. Vincent	510	296	58	5	1	153	30	30	6	5	1	2		1	0	18	4
Mem. Tech.	258	3	1	0	0	29	11	3	1	3	1	207	80	12	5	1	0
Ipswich	132	75	57	1	1	39	30	0	0	0	0	14	11	3	2	0	0
Warwick	133	82	62	7	5	19	14	9	7	2	2	3	2	6	5	5	4
Buchtel	422	216	51	5	1	82	19	101	24	3	1	3	1	1	0	11	3
Firestone	430	370	86	0	0	18	4	30	7	3	1	1	0	2	0	6	1
Kenmore	298	167	56	4	1	3	4	116	39	1	0	1	0	3	1	3	1
South	215	36	17	6	3	70	33	93	43	1	0	1	0	5	2	3	1
Hower Voc.	166	2	1	0	0	3	2	0	0	1	1	157		2	1	1	1
Bronson	149	47	32	6	4	25	17	38	26	13	9	18	12	1	1	1	1
Frazee	102	30	29	13	13	18	18	13	13	4	4	14	14	1	1	9	9
Mt. Healthy	294	111	38	1	0	70	24	70	24	6	2	7	2	8	3	21	7
W. Lafayette	162	150	93	0	0	2	1	4	2	2	1	1	1	0	0	3	2
Havre DeGrace	179	73	40	6	1	64	36	16	9	1	1	21	12	1	1	2	1
Lampasas	113	71	63	6	5	4	4	5	4	6	5	12		2	2	7	6
Yazoo City	146	85	58	2	1	4	3	10	7	2	1	33	23	8	5	2	1
Vashon Is.	123	85	69	1	1	3	2	21	17	3	2	2	2	1	1	7	6
Elma	109	39	36	10	9	13	12	21	19	0	0	6	6	4	4	16	15
La Junta	135	93	69	1	1	9	7	23	17	0	0	1	1	1	1	7	6
Castlemont	433	164	58	4	1	109	24	69	16	11	3	17	4	22	5	43	10
Oakland	372	180	48	2	1	57	15	53	14	4	1	21	6	13	3	42	11
Skyline	688	492	73	3	0	31	5	80	12	2	0	23	3	12	2	45	7
Total	6,415	3,242	50	89	1	1,060	17	987	13	77	1	567	9	114	2	272	4

To check on the validity of the questionnaire responses we occasionally, in interviews, asked students what course of study they were enrolled in or what curriculum they were enrolled in. We were surprised to discover that a substantial fraction--perhaps as many as 1/5--did not know how to answer our question. This was particularly true in the California schools, where it simply is not a meaningful question. Most of these students do not perceive themselves as being in a particular curriculum or course of study; they elect subjects in accordance with their post-high school plans or, if they do not have any definite plans, they sample subjects which sound interesting. This practice is no doubt related to the fact that in California any 18-year-old can be admitted to a junior college, even without being a high school graduate.

Curriculum Differences

In further pursuit of differences among the curricula, the BEQ responses of the students in each curriculum were examined. Selected responses will be described here; complete tables are included in Appendix E.

Subjects Taken. Table 3 summarizes the major differences in subject enrollments among the curricula as far as grades 9 and 10 are concerned. (The results reported are based on questions 172 through 177 of the BEQ. English and literature were omitted from the questionnaire in the belief that the responses would not discriminate among the students.) The major distinction would seem to be that the academic students enrolled in foregin languages, while the non-academic students enrolled in vocational courses (home economics, shop, agriculture, etc.); other enrollments for the two groups were roughly similar. "Business" and "general" were similar, except that the General students took less foreign language and less mathematics.

Occupational Planning. When asked as eleventh graders whether "during the last two years" they had seriously considered any occupations for their life work (Q.110), 25% of the total sample reported they had not. Considering that these respondents were in the 11th grade, it is surprising that so large a percentage would give such a report. For the various curriculum groups the percentages who had not seriously considered any occupations varied from 22% for the academic and the business students to 39% for those who reported they were enrolled in the general curriculum. This reinforces the conception of the general curriculum as a program for students who do not as yet have any occupational plans.

The same pattern of responses was observed on the next question (Q.111), in which the respondents were asked about their plans for the year after graduation from high school. Eighty-five percent of the academic students reported they had fairly definite plans, while only 59% of the general students reported so.

The students' plans are summarized in Table 4. It is interesting that a significant fraction of the students enrolled in each of the nonacademic curricula reported that they planned to attend a four-year

Table 3

Median Number of Semesters of Certain Subjects
Taken by Students in Various Curricula
During 9th and 10th Grades

	Acad.	Agri.	Bus.	Gen.	Home Ec.	Voc.
Business & Commercial	0	1 or 2	1 or 2	1 or 2	1 or 2	0
Foreign Languages	3 or 4	0	1 or 2	0	1 or 2	0
Social Studies	3 or 4	3 or 4	3 or 4	3 or 4	3 or 4	3 or 4
Home Ec., Shop, Agri., Voc'l.	0	3 or 4	1 or 2	1 or 2	3 or 4	3 or 4
Math	3 or 4	3 or 4	3 or 4	1 or 2	1 or 2	3 or 4
Sciences	3 or 4	1 or 2	1 or 2	1 or 2	1 or 2	3 or 4

Table 4

Students' Plans Following Graduation by

Curriculum (Q. 112)

	Acad.	Agri.	Bus.	Gen.	Home Ec.	Voc.
Full time job or military service	5%	32%	17%	24%	21%	28%
4-year college	62%	20%	13%	16%	19%	18%
School or college other than 4-year college	16%	12%	23%	14%	8%	16%
Housewife	1%	4%	5%	5%	10%	2%
Other	5%	13%	19%	12%	16%	13%
No response	11%	19%	23%	29%	26%	23%
Total	100%	100%	100%	100%	100%	100%

college. In the follow-up study to be reported in Chapter 11, this was found to be the actual case. High school curriculum identification is by no means as highly related to post-high school occupation as one might assume it to be.

As eleventh graders an average of only 22% of the "non-academic" students had "fairly definite plans" to obtain a full-time job or enter the military service on graduation. The highest proportion (32%) was reported for students enrolled in agriculture.

Family Background. Another series of questions inquired about the family background of the students in the various curricula. Here we find a weak association between the curriculum identification of the students and the level of parents' education. Thirty-two percent of the fathers of academic students were college graduates, whereas an average of 8% of the fathers of students enrolled in non-academic programs were college graduates. Similarly, 18% of the academic students' fathers were professionals, while an average of only 4% of the others' fathers were. Also present is evidence of the tendency for children to follow in their fathers' footsteps, a finding widely reported in the sociological literature. For example, 12% of the agricultural students' fathers were farm managers, whereas only 2% of the others' parents were. These questions will be discussed further in Chapter 11.

Peer Group Influences. Which program the student identifies with is also related to the plans his friends have. Seventy percent of the academic students report that 60% or more of their friends plan to attend a four-year college while only 28% of the non-academic students report that that high a percentage of their friends plan to attend a four-year college. The direction of causality is, of course, uncertain. Identifying with a college preparatory course may merely result in one acquiring friends who also plan to attend college.

Parental Influences. The next pair of items concerned parents' feelings about their children's continuing their education beyond high school (items 120 and 121). As one might expect, a much higher percentage of the parents of academic students strongly favored their children's continuing their education, with mothers feeling slightly stronger about it than fathers. Eighty-eight percent of the "academic" mothers strongly favored their children's continuing their education, vs. 54% of the "non-academic" mothers, while 85% vs. about 52% of the fathers felt so.

Perception of Courses. Next the students in various curriculum programs were asked to indicate which subjects they were enrolled in, and whether the course was boring or interesting. Ninety-five percent of all students were enrolled in athletics or physical education, and 68% of them found the courses interesting, a higher percentage of the academic students finding it interesting (70%) than of the others (64%).

Eighty-eight percent of the business students took typing, but so did approximately 55% of the other students. Sixty-seven percent of the business students found it interesting, while only about 35% of the non-business students did.

The figures for business-commercial courses are similar, except that only a small percentage (16%) of the academic students enrolled in such courses.

Driver's education was taken by a fairly uniform 62% of the students, with a fairly uniform 42% finding it interesting, as opposed to about 8% who found it boring.

English and literature were taken by practically all students, the lowest percentage being 92% for the agricultural students. Fifty percent found it interesting, ranging from 31% of the agricultural students to 60% of the academic students.

Foreign languages, however, were taken by less than half of the non-academic students, while 92% of the academic students studied them. The academic students also liked them better; 54% found them interesting versus approximately 35% for the non-academics.

Nearly all students took one or more social studies course, and a higher percentage found it interesting than the percentage finding English and literature interesting. Again, more of the academic students found social studies interesting than did the non-academic students (63% vs. approximately 42%).

The situation was reversed with home economics, shop, agriculture, and other vocational courses. Almost one-half (49%) of the academic students had taken none of these courses, while only 20% of the non-academic students had not taken any. Eight percent of the home economics, and 5% of the vocational students, said they had not taken these courses, a puzzling report.

A very high proportion of those who did take vocational courses found them interesting. Mathematics and science were similar. Practically all of the academic students took these subjects, and 85% of the non-academic students did. Most of the academic students found the courses interesting--more found science interesting than any other academic course--while the non-academic students found them less so, although more found them interesting than boring.

The ratings of the various courses are summarized in Table 5. If the ratio of the number finding a subject interesting to the number finding it boring is acceptable as an index of student interest, we can say that the vocationally oriented courses met with the most interest, while foreign languages met with the least interest. Driver's education ran a close second in interest, while mathematics was close to foreign languages in lack of interest. Why driver's education should have such a high index value is of interest. The data indicated that it resulted primarily from relatively few students' finding it boring.

Within curricula there were some interesting deviations from the overall means. The academic students found science most interesting and agreed with the other groups that foreign languages were least so. The business students rated social studies least interesting, as did the home economics students.

Table 5

Ratio of Number of Students in Each Curriculum Finding Certain Subjects Interesting to Number Finding Them Boring

	Acad.	Agri.	Bus.	Gen.	Home Ec.	Voc.	Means
Home Ec., Shop, Agri., Voc'l.	4.0	3.9	5.6	6.8	13.0	19.8	8.8
Driver's Education	4.3	4.6	5.9	5.0	10.5	14.0	7.4
Typing	3.0	1.0	11.1	2.8	2.0	3.5	3.9
Business & Commercial	3.0	1.2	10.0	3.4	1.4	2.5	3.6
Science	6.3	2.6	2.1	2.6	2.0	2.5	3.0
English & Literature	4.3	1.2	2.4	1.4	1.7	1.0	2.0
Social Studies	3.7	1.4	1.2	1.7	1.1	2.2	1.9
Math	3.4	1.0	1.4	1.2	1.3	1.4	1.6
Foreign Languages	2.2	1.2	1.3	.9	1.5	1.1	1.4
Means	3.8	2.0	4.6	2.9	3.8	5.3	3.7

When we examine the mean interest of each curricular group, we see that the vocational students reported the greatest interest, i.e., the mean of the ratios across subjects was largest for them. At the other extreme were the agricultural students with a ratio of "interesting" to "boring" of 2.0.

Anticipated Utility. Table 6 summarizes a series of items in response to the question "Do you think the following courses will be useful in helping you earn a living?" Generally, as one might expect, the vocationally oriented courses were perceived as most useful, and foreign languages were consistently perceived as least useful. Judging from the mean ratios across subjects, the business and commercial students perceived their program as most useful, while the agricultural students viewed their program as least useful.

The rank order correlation between the interest indices and the usefulness indices was .70, suggesting the hypothesis that students tend to regard as interesting those courses that they perceive as useful. The direction of causality could, of course, be reversed. An alternative hypothesis would be that the correlation results from a methods factor common to both items.

Changes Over Time

To further describe the differing experiences of the students in the various curricula, their questionnaire responses were examined at three points: grade 7, grade 9, and grade 11. Figure 5 shows the results for one variable: whether the respondent found mathematics to be interesting or not. Since this variable is correlated with ability, the two major curriculum groups (academic and non-academic) were subdivided into high- and low-ability groups, with the comparable ability groups being matched man-for-man on the basis of their estimated true grade 7 Total scores on the School and College Ability Test (SCAT)[1]. In other words, at the grade 7 level, the High-Ability Academic students had the same distribution of estimated true SCAT Total scores as the High-Ability Non-Academic students and, similarly, the two low-ability groups. Matching on estimated true scores was an effort to reduce the kind of regression towards the mean which occurs when subjects are selected from two populations with different means.

It seems unlikely that the distinct changes which can be observed in Figure 5 are still attributable to regression, but the possibility exists, since the academic and non-academic students were not matched on a number of additional variables which might account for the observed differences--socioeconomic status and school attended, for example. For this reason, the results for other variables will not be reported here. It is interesting to note, nevertheless, that the percentage finding mathematics interesting increased from the seventh to the ninth grade and then for all groups decreased from the ninth to the eleventh grade. Does this possibly say something about the effect of studying mathematics at the high school level?

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[1]True scores were estimated by regressing each student's observed score towards the mean of his group (i.e., academic or non-academic) using reliabilities computed for the total Growth Study sample.

Table 6

Ratio of Number of Students in Each Curriculum Perceiving Subjects as Useful to Number Perceiving Them as Not Useful

	Acad.	Agri.	Bus.	Gen.	Home Ec.	Voc.	Means
Home Ec., Shop, Agri., Voc'l.	1.6	5.6	2.5	6.1	9.8	19.8	7.6
Driver's Education	2.5	7.1	5.7	5.3	5.3	5.4	5.2
Typing	7.3	2.9	27.2	5.0	9.5	3.1	9.2
Business & Commercial	2.8	3.0	39.0	6.7	4.8	4.7	10.2
Science	4.2	2.9	.8	1.7	1.6	1.8	2.2
English & Literature	11.0	2.1	9.2	5.7	4.7	4.1	6.1
Social Studies	2.3	1.5	1.3	1.7	1.2	1.7	1.6
Math	7.1	2.6	3.9	4.6	2.9	8.0	4.8
Foreign Languages	1.6	.5	.8	.8	1.4	.5	.9
Means	4.5	3.1	10.0	4.2	4.6	5.4	5.3

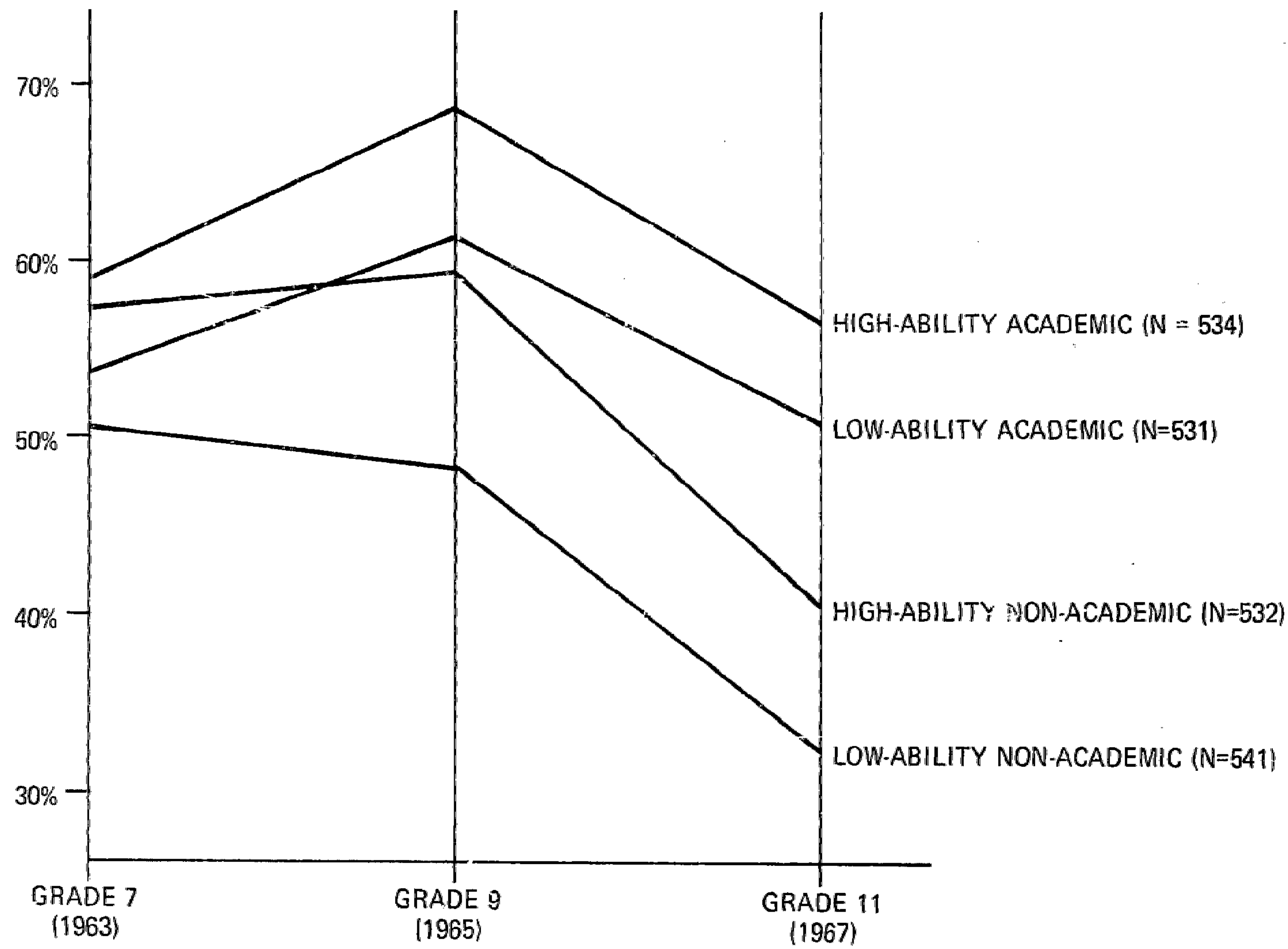

Figure 5. Percentages of Academic and Non-Academic Students finding Mathematics Interesting.

The last descriptive results to be reported concern the test performance of the students in various curriculum groups. Figure 6 shows the mean scores for STEP Mathematics for grades 5 through 11. The samples in question are longitudinal; that is, the same students are involved at each grade level. (The requirement of complete data over a six-year period resulted in a substantial reduction in sample N's. Two curriculum groups, agricultural and home economics, whose N's were reduced to 23 are omitted from the tables and figures.) The mean differences among the groups are startling. At grade 11 approximately four years of achievement separates the academic students from the vocational, home economics and business students. In other words, by grade 11 the vocational, business, and home economics students achieve on the average a level of sophistication in mathematics which the academic students had achieved in grade 7. Table 7 provides the sample N's, means, and standard deviations. (Comparable statistics for the other measures are included in Appendix E) Figure 7 and Table 8 provide parallel information for STEP Reading. Generally the picture is the same as for STEP Mathematics, except that the discrepancy between the academic and non-academic students is not quite as large, in terms of grade equivalents.

The Test of General Information (TGI) provided somewhat different results. The mean scores for the 10-item Entertainment and Recreation subscale are shown in Figure 8 and the Industrial Arts subscale in Figure 9. The means and standard deviations are given in Appendix E (For the purposes of the graphs, the TGI scores were standardized with a mean of 50 and a standard deviation of 10.) The TGI scales were originally designed to measure the student's acquisition of information in non-academic areas, with the possibility in mind that such acquisition might be independent of school achievement. The present results, as well as previously reported results (Hilton & Myers, 1967), indicate that the two kinds of acquisition are not independent. Usually there is a correlation of approximately .60 between the TGI scales and the SCAT and STEP scales. This correlation can be seen in Figure 8 where the academic students are well above the non-academic students. In Figure 9, however, the relationships change over time. The relative superiority of the academic students decreases from grade 5 to grade 11, while the mean scores of the vocational students steadily increase. Presumably this reversal of the growth pattern is directly attributable to the content of the scale, i.e., items measuring knowledge of industrial arts. This matter will be discussed further later.

With the exception of the Industrial Arts scales, the figures for the various achievement and ability measures are extraordinary in one particular respect--the stability of the trend lines for each curriculum group. This could be attributable to a number of conditions. The first possibility is that the effect of a given curriculum is to preserve the status quo or, more precisely, to maintain the past growth record of selected groups of students, i.e., the students in each curriculum. A second possibility is that the effect of a given

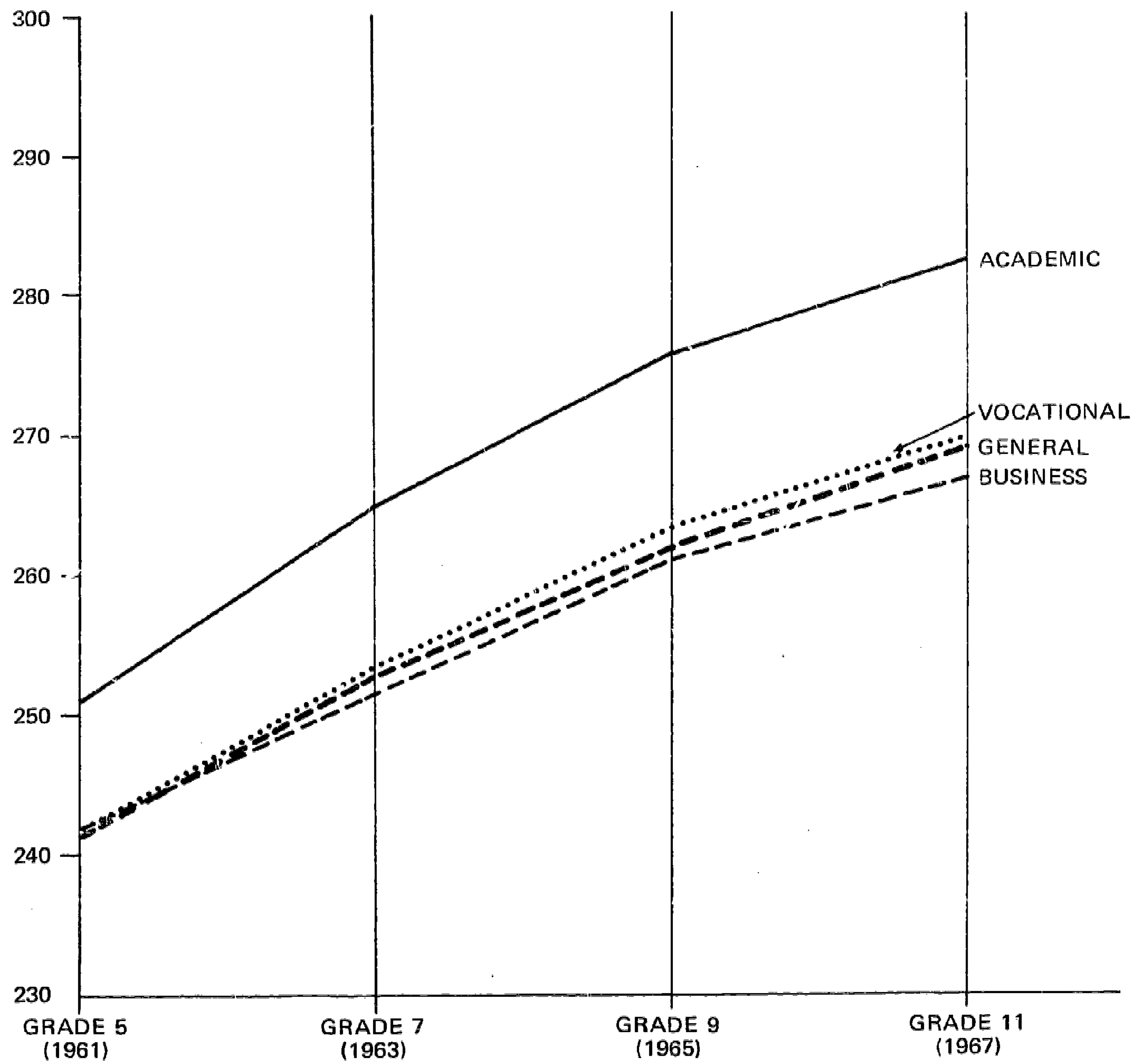

Figure 6. Mean Scores on STEP Mathematics for Four Major Curriculum Groups

Table 7

Means and Standard Deviations of STEP Mathematics Scores at Four Grade Levels by Curriculum

Curriculum		Grade 5	Grade 7	Grade 9	Grade 11
Academic	N	2111	2076	1893	2074
	Mean	250.91	264.88	275.63	282.45
	SD	10.54	12.43	12.16	13.78
Business	N	679	664	664	653
	Mean	242.36	251.66	261.39	266.70
	SD	9.11	12.22	12.35	15.50
General	N	618	603	599	592
	Mean	242.02	251.97	261.58	267.26
	SD	9.80	13.13	13.35	16.66
Vocational	N	319	312	310	313
	Mean	242.15	252.79	263.51	268.86
	SD	9.22	12.22	11.82	15.44

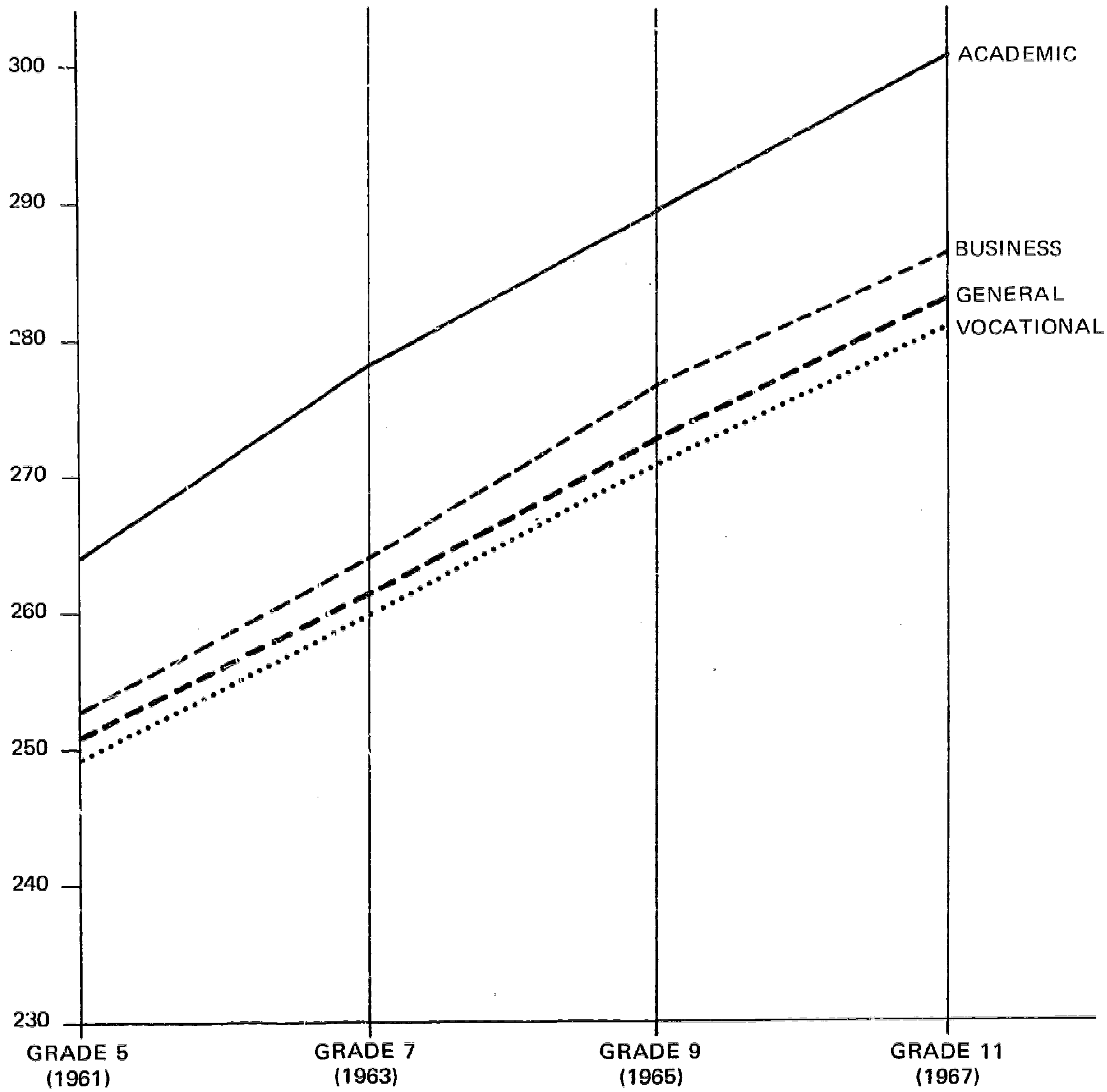

Figure 7. Mean Scores on STEP Reading for Four Major Curriculum Groups .

Table 8

Means and Standard Deviations of STEP Reading Scores at Four Grade Levels by Curriculum

Curriculum		Grade 5	Grade 7	Grade 9	Grade 11
Academic	N	2109	2071	1892	2075
	Mean	264.09	278.01	288.93	300.74
	SD	15.88	16.00	13.54	15.15
Business	N	678	659	664	648
	Mean	252.78	263.93	276.60	286.56
	SD	13.23	15.35	15.36	15.67
General	N	616	608	600	580
	Mean	250.70	261.49	272.31	282.80
	SD	14.16	16.27	16.63	16.95
Vocational	N	319	311	313	316
	Mean	249.53	260.29	270.98	280.89
	SD	13.01	15.88	16.55	17.96

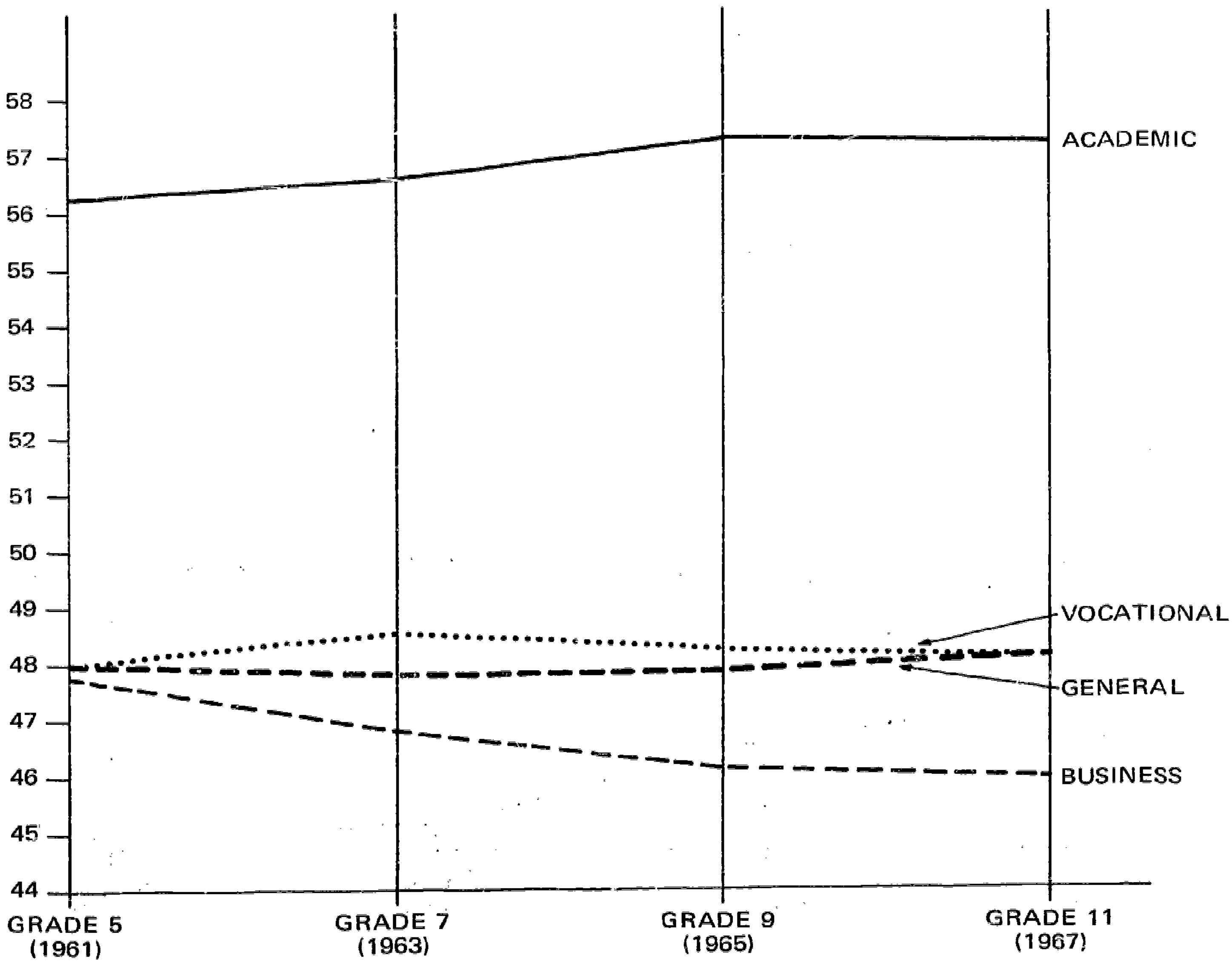

Figure 8. Mean Standardized Scores on TGI Entertainment and Recreation Scale by Year and Curriculum.

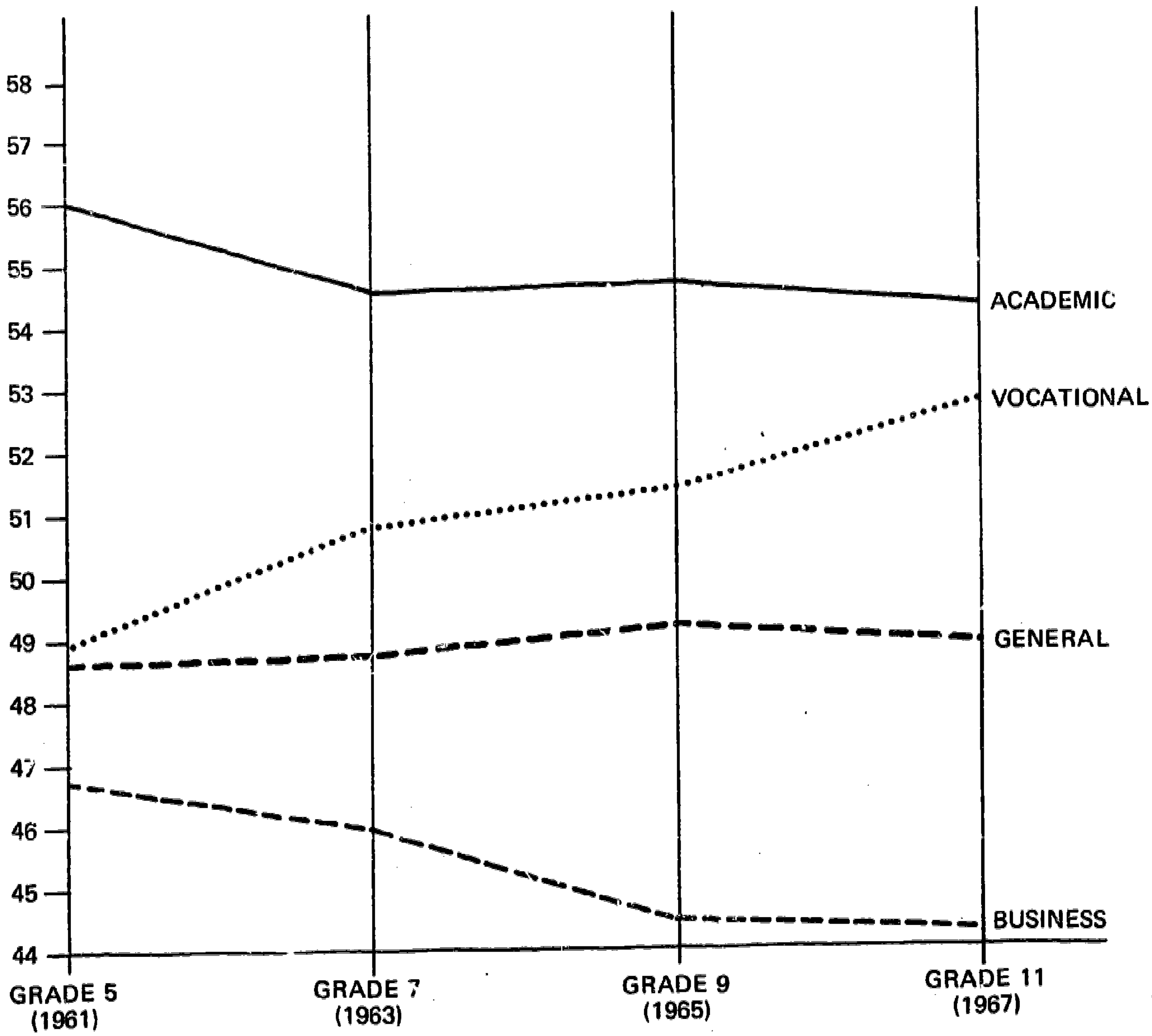

Figure 9. Mean Standardized Scores on TGI Industrial Arts Scale by Year and Curriculum.

curriculum is negligible--students continue to achieve at whatever growth rate they have exhibited in the past. A third conception differs only in emphasis from the previous two. This is the view of the high school as a student sorting device. A student's achievement level, self-concept and interests are accepted as given. The problem of the school administration is, through trial and error, to find a program of subjects which fits the student, especially in terms of his achievement level. If the "first" algebra group is too fast for the student, he will be transferred immediately or at the beginning of the next semester to a slower algebra group. If he fails algebra the first time he takes it he is encouraged to repeat it. If he fails it again he is assigned to general mathematics or business arithmetic, possibly with attention paid to who teaches the course (How demanding is Mr. X?) or who is enrolled in it (Is it a "fast" group or a "slow" group?). Finally he may be permitted to drop mathematics altogether, a step which may involve his disaffiliating from a program of study, e.g., a vocational course, which he had been pursuing.

The exact path followed differs widely from one high school to another, depending--our observations suggest--on the unique history and current staffing of each high school. Visits to the 28 high schools in the Growth Study sample revealed a surprising heterogeneity as far as curriculum offerings and procedures are concerned. One strong-minded and respected (or feared) high school department head can have an all-important and lasting effect on the offerings, textbook selection, and teaching and administrative procedures of a particular school. But a primary objective seems to be common to all school administrators--to find a classroom in which each student can survive the school year.

Summary and Conclusion

In this chapter the questionnaire responses and test performance of students identified with various high school curricula have been described in an effort to discern, first, the operational significance of the term "vocational education" in the United States and, second, some of the implications of the term for student growth and development.

The research was limited to self-report questionnaires and conventional measures of achievement (the School and College Ability Tests, the Sequential Tests of Educational Progress and the Test of General Information). The limitations of these tests as measures of the educational growth of all the students in a comprehensive high school give rise to the first conclusion from this descriptive study, namely that our measures of student growth, especially of students in "non-academic" programs, are woefully deficient. It is important to measure growth in reading skills, understanding of science and social studies; and adequate measures of such cognitive skills are available. It is equally important to have measures of students' vocational skills, including such elusive qualities as respect for craftsmanship, work values, and human relations skills. (An inkling of the kind of growth which may be observed is seen in the analysis of the industrial Arts Scale of the Test of General Information.)

We would, therefore, fully endorse the following statement: "Traditionally, schools have measured growth by achievement in subject matter alone. Much of such growth may be irrelevant. We have to start measuring growth by how much a school prepares a student, from his very earliest days, to contribute something useful to the society he's going to live in."[2]

As far as questionnaire responses were concerned, 50% of the total sample of 11th graders regarded themselves as taking the "academic or college preparatory" course, although interviews indicated many students were uncertain of their response. What curriculum a student is identified with has become for many students an irrelevant question, particularly in schools in the West. With the rapid growth of open-enrollment colleges it is no longer necessary--whether desirable or not--for a student to complete a prescribed program of college preparatory subjects. It was not unusual for students who planned to enroll in a two- or four-year college to take what would formerly have been regarded as a straight program of vocational preparation, a program in television repair, for example.

From school to school wide variation was observed in the proportions enrolled in various programs. How many students were enrolled in the college preparatory (academic) program seemed to depend on a number of variables, including the presence or absence of a technical high school in the community, the presence or absence of an open-enrollment junior or four-year college in the community, the socioeconomic level of the parents of the students in the school and local employment opportunities. (For any given school, one can predict that the number of students enrolled in the college preparatory program will be approximately 80% of the number of students with fathers who are college graduates.)

When the subjects taken by students in various curriculum programs are examined, one is struck by their similarity. The essential difference seems to be that the non-academic students substitute vocationally oriented subjects for the languages which the academic students take. But there are many exceptions. In fact, in visiting the Growth Study schools, and in examining the data files, we seldom found evidence of highly structured and clearly defined curriculum programs.

There also was no clear correspondence between the students' future plans and the programs they were enrolled in. Only 22% of the non-academic students planned to go directly into work or military service on graduation, and 16% planned to attend four-year colleges. Although our results do not permit us to say so with any certainty, we suspect that this lack of structure is desirable. For one reason, it permits greater student mobility from one curriculum program to another. Considering that few students have precise occupational plans during high school--25% of the 11th graders had not considered any occupation seriously--such mobility would seem to be necessary.

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[2]Office of Education New Directions in Vocational Education. Superintendent of Documents Catalog No. FS 5.280:80047 U. S. Govt. Printing Office, Washington: 1967.

Generally speaking, students were more interested in subjects relevant to their chosen curriculum than in irrelevant subjects. The business students were most interested in business subjects, for example, and the vocational students were most interested in vocational courses. They also regarded the most useful courses as most interesting. We also reported earlier the observation that students moved away from academic areas in which they were unsuccessful (the sorting process). All these observations suggest a complex model of student curriculum choice. Three variables in the model are past success, interest, and perceived usefulness. How these variables influence each other is questionable. As a hypothesis, we would propose that interest and choice result from past success and perceived usefulness. Later chapters in this report will return to this question.

Generally, the vocational students reported the most interest in their courses. Would these students have reported the same degree of interest if they had been forced to take the traditional college preparatory curriculum? This is a question we would like to answer, but without a controlled experiment we cannot. A method of analysis which is described in Chapter 10 may, however, permit some conclusions of this type.

Whether curriculum differences remain when earlier scores are made equal (by analysis of covariance), and when all the available measures are examined simultaneously, was investigated in a study described in the next chapter.

Chapter 6

Educational Achievement Prior to and During High School[1]

Michael J. Patton[2]

Educational achievement and scholastic ability during late childhood and adolescence have not found a prominent or well-articulated place in existing theories of vocational development (cf. Borow, 1964). Yet their relationships to "vocational maturity" and adjustment have been documented by Crites and Semler (1967). And other investigators (see Halpern, 1967; Remmers & Radler, 1957) have pointed out that adolescents regard their own past and future achievement as prominent factors to be accounted for in educational and vocational planning, as do educational researchers (Tiedeman & Sternburg, 1952).

It is not generally known, for example, what the achievement, ability and socioeconomic status are like for specific groups of students, and what relationships early differences in attributes have to later achievement and to other educational experiences. Because school guidance workers assist students in making educational and vocational plans for the manifest purpose of facilitating their intellectual and vocational development, it would seem useful to have more systematic knowledge of the prior educational achievement of students who later become associated both with a specific secondary school and with a course of study in that school. In this way it might become possible not only to predict more accurately a student's eventual curricular choice but, more important, to help the student plan his educational experiences such that the school is more likely to help, not hinder, this important aspect of development.

In a previous and informal analysis (Patton & Morse, 1967), educational achievement was observed to differ substantially among student groups in one sample as early as grade 7 when these groups were identified by sex, by the high school they attended, and by the curriculum in which they were enrolled at grade 11. Since it was not possible to establish the significance of the observed differences nor to determine their nature, these observations prompted the present study in which prior achievement, scholastic ability and socioeconomic status have been examined as correlates of the student's later achievement, his sex, the high school he attended and his curriculum choice. The purpose of this research has been to investigate the educational achievement, ability and socioeconomic status of a group of students over time.

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[1]The author wishes to express his appreciation to Thomas L. Hilton and to Charles E. Hall for their valuable assistance.

[2]Now at the University of Utah.

Method

The data with which this research is concerned were taken entirely from the Growth Study files. The data for the matched-longitudinal subsample used in this study are composed of scores at three points in time on the appropriate forms of School and College Ability Test (SCAT) and the Sequential Tests of Educational Progress (STEP).

Sample and Design

The sample of 2,952 students (1,345 boys and 1,607 girls) whose scores were analyzed were 7th graders in 1961, 9th graders in 1963, and 11th graders in 1965. In order to examine these data retrospectively by school and curriculum groups beginning at grade 7, it was necessary first to establish group identity from grade 11 data and then determine that combination of schools, curricula, and sexes which would result in as little biasing of the data as possible. A three-factorial design was formulated, in which 18 "comprehensive" high schools, five curriculum groups (i.e., undecided, vocational, business, general, and academic), and the two sexes formed the design factors. Nine variables were used in the analysis: six STEP scores, two SCAT scores, and a measure of the socioeconomic status (SES) of the student's family derived from several items in the Background and Experience Questionnaire that was included in the 1965 test administration.

Data Analysis

A multivariate analysis of variance program (MANOVA) devised by Clyde, Cramer, and Sherin (1966) was used to examine the results associated with the design factors at each of grades 7, 9 and 11. Therefore, this program provided multivariate F ratios and the probability levels of the main and interaction effects associated with the design factors. In addition, univariate F ratios corresponding to each variable were calculated and shown with each multivariate F ratio. The program also included discriminant scores, as well as both discriminant function coefficients (not reported here) and "principal components of the hypotheses" associated with a multivariate F ratio. Unlike the more common discriminant function coefficients, principal component coefficients are Pearson product-moment correlations between the canonical variate(s) associated with a multivariate F ratio and each of the variables. In other words, they are coefficients describing the relationship between the combination of all the variables (i.e., the canonical variate) which best discriminates among the groups and each of the variables separately (cf. Hall, 1967). On the basis of the principal component coefficients, the discriminant functions associated with a significant multivariate F ratio have been given tentative interpretive labels in the discussion that follows. It is recognized that even slight rotations of the vectors could result in marked changes in the size of the principal component coefficients, and for that reason the reader is cautioned against "reifying" the discriminant function labels.

The major analyses to be reported here sought to establish a baseline with grade 7 data, and an indication of change with grades 9 and 11 data. By controlling statistically, through the use of covariance analysis, for the effect of grade 7 STEP and SCAT scores in the MANOVA of grade 9 scores, an attempt was made to learn what new differences or performance attributes were not predictable from grade 7 data. For the same reasons, grades 7 and 9 STEP and SCAT scores were introduced as covariates in the MANOVA of grade 11 data.

Procedural Checks on SES and SCAT Variables

The argument has been raised that many of the achievement differences among students are associated more with conditions outside the control of the school system than with factors controlled by the schools (cf. Coleman, 1966). Therefore, if SES is controlled statistically in such analyses, differences in achievement among students classified by curriculum and high school ought to lessen, or so the argument goes. Perhaps this might occur if the investigator is employing a verbal achievement measure that is known to be highly associated with a student's home background. If, however, several different types of reliable achievement and aptitude measures are used, the results of covarying SES may present a different picture. To examine this possibility a MANOVA was first run on 7th grade STEP and SES scores and then on 7th grade STEP scores using SES as a covariate.

The results of both analyses were practically identical. In both, small but significant multivariate F ratios occurred for the interaction between the curriculum and sex factors ($p < .001$), and larger F ratios were found to be associated each with the curriculum, sex, and school factors ($p < .001$). When SES was used as a covariate, significant multivariate F ratios occurred with the same factors, but now five instead of six significant discriminant functions were found associated with the school factor, and it is clear that achievement differences still remain. The position is taken in this research that the SES variable adds an important dimension in understanding the performance of students classified by sex, high school and curriculum in grades 7, 9 and 11.

Because of the sizable correlations between the SCAT and STEP measures it was also decided to examine whether SCAT added anything new to the analysis beyond that contributed by STEP. Table 9 reports the correlations among these two measures, and the existence of several sizable SCAT-STEP correlations provides warrant for asking what SCAT might contribute. A MANOVA was first run using only STEP and SES, and then a second analysis was conducted in which SCAT was included and STEP and SES were treated as covariates.

It will be recalled that when STEP and SES are analyzed alone a small but significant multivariate F occurred with the interaction between curriculum and sex ($p < .001$), as did larger multivariate F

Table 9

Within Cells Correlations of 7th Grade STEP and SCAT Variables
with Standard Deviations on the Diagonal

Variable	STEP Math	STEP Science	STEP Social Studies	STEP Reading	STEP Listening	STEP Writing	SCAT Verbal	SCAT Quantitative
STEP Math	SD=11.078							
STEP Science	.577	SD=9.310						
STEP Social Studies	.626	.681	SD=11.208					
STEP Reading	.604	.627	.713	SD=13.784				
STEP Listening	.555	.598	.685	.683	SD=11.894			
STEP Writing	.608	.620	.691	.752	.627	SD=13.184		
SCAT Verbal	.597	.635	.702	.758	.719	.707	SD=10.493	
SCAT Quantitative	.669	.527	.599	.570	.504	.582	.570	SD=11.223

ratios for the curriculum, sex and school factors ($p < .001$). The analysis of 7th grade SCAT scores when STEP and SES were treated as covariates revealed that the curriculum-sex interaction was no longer significant ($p < .390$), but that multivariate F ratios for curricula ($p < .001$), sex ($p < .002$) and schools ($p < .001$) were. Table 9 notwithstanding, these results suggest that the two SCAT measures contribute useful information to the examination of differences among groups, beyond that afforded by STEP and SES, and that this is especially so in the case of differences associated with the curriculum, sex and school factors.

Results

Interactions

The multivariate F ratio for the three-way interaction among schools, sex and curriculum groups was not significant at grades 7, 9 or 11. The two-way interactions between school and sex, curriculum and sex, and school and curriculum were associated with very small but significant multivariate F ratios at each grade. In view of the smallness of the differences associated with the two-way interactions, little interpretive weight will be given to these results. Instead the reader is referred to Figure 10, where the small differences associated with the school-sex interaction are illustrated. The school-sex interaction was significant at grades 9 ($F = 1.290$, df 153/22,798, $p < .009$) and 11 ($F = 1.734$, df 153/22,734, $p < .001$, and $F = 1.382$, df 128/22,442, $p < .003$), particularly for achievement in STEP Science. The upper half of Figure 10 illustrates the pattern of school-sex differences in STEP Science for those schools where this relationship was most divergent at grade 9, while the lower half portrays the same thing for the most divergent cases at grade 11. In both cases the most divergent school-sex groups were all above the mean, and that statistic has been plotted to provide further contrast. The relationship between boys' and girls' gains on STEP Science appears to be different in these different schools, although in schools with close to zero discriminant scores, the STEP Science curves are the same for both sexes.

Small but significant differences were also found for the curriculum-sex interaction at grades 7, 9 and 11. At all three grades, the significant sex differences within curricula are most prominent on STEP Science, and at grades 7 and 11 this occurs for the boys and girls who eventually enroll in either the academic or vocational programs (i.e., grade 7: $F = 2.241$, df 36/10,693, $p < .001$; grade 11: $F = 2.131$, df 36/10,633, $p < .001$). At grade 9, the sex differences in STEP Science are most divergent in the academic and business groups ($F = 1.558$, df 36/10,663, $p < .018$). Figure 11 illustrates these differences.

Again, small but significant differences were found for the school-curriculum interaction in grades 7, 9 and 11. At grade 7, the results ($F = 1.182$, df 243/24,454, $p < .028$) indicate that on a significant discriminant function defined primarily by a principal

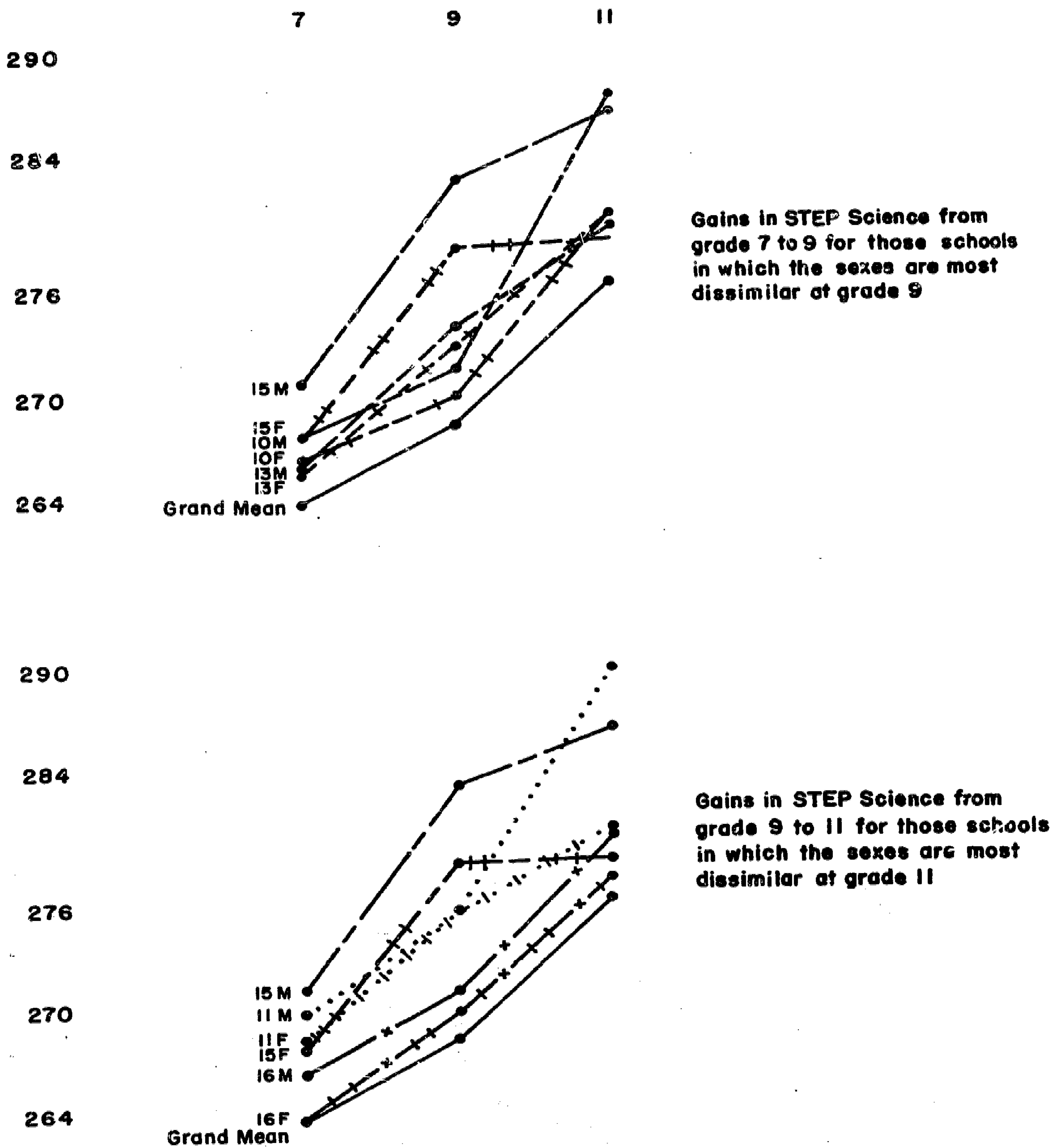


Figure 10. Plot of unadjusted STEP Science mean scores associated with the School-Sex interaction.

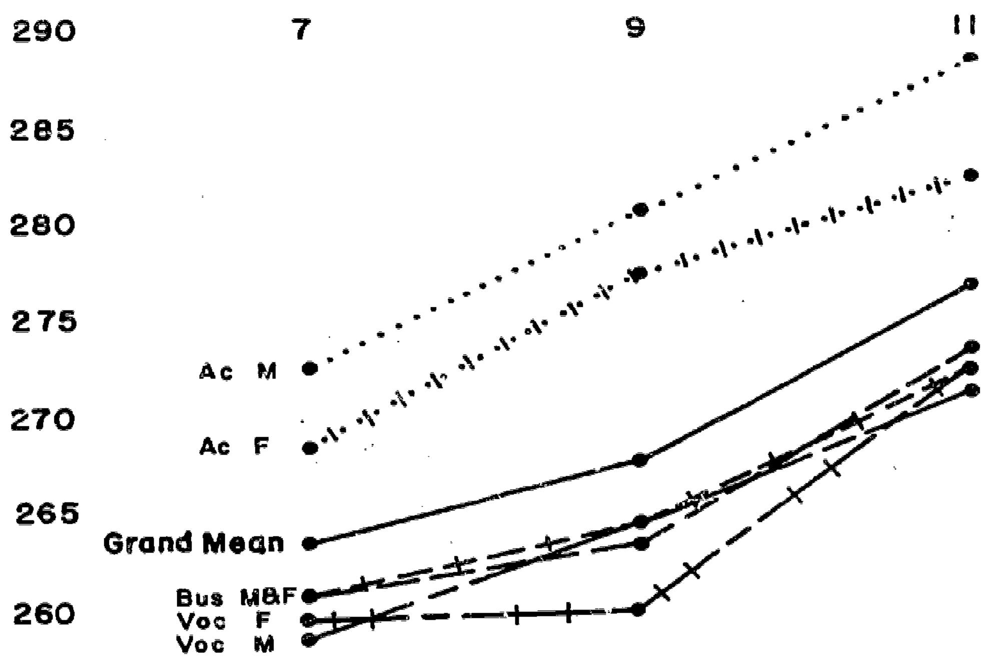


Figure 11. Plot of unadjusted STEP Science mean scores associated with Curriculum-Sex interaction.

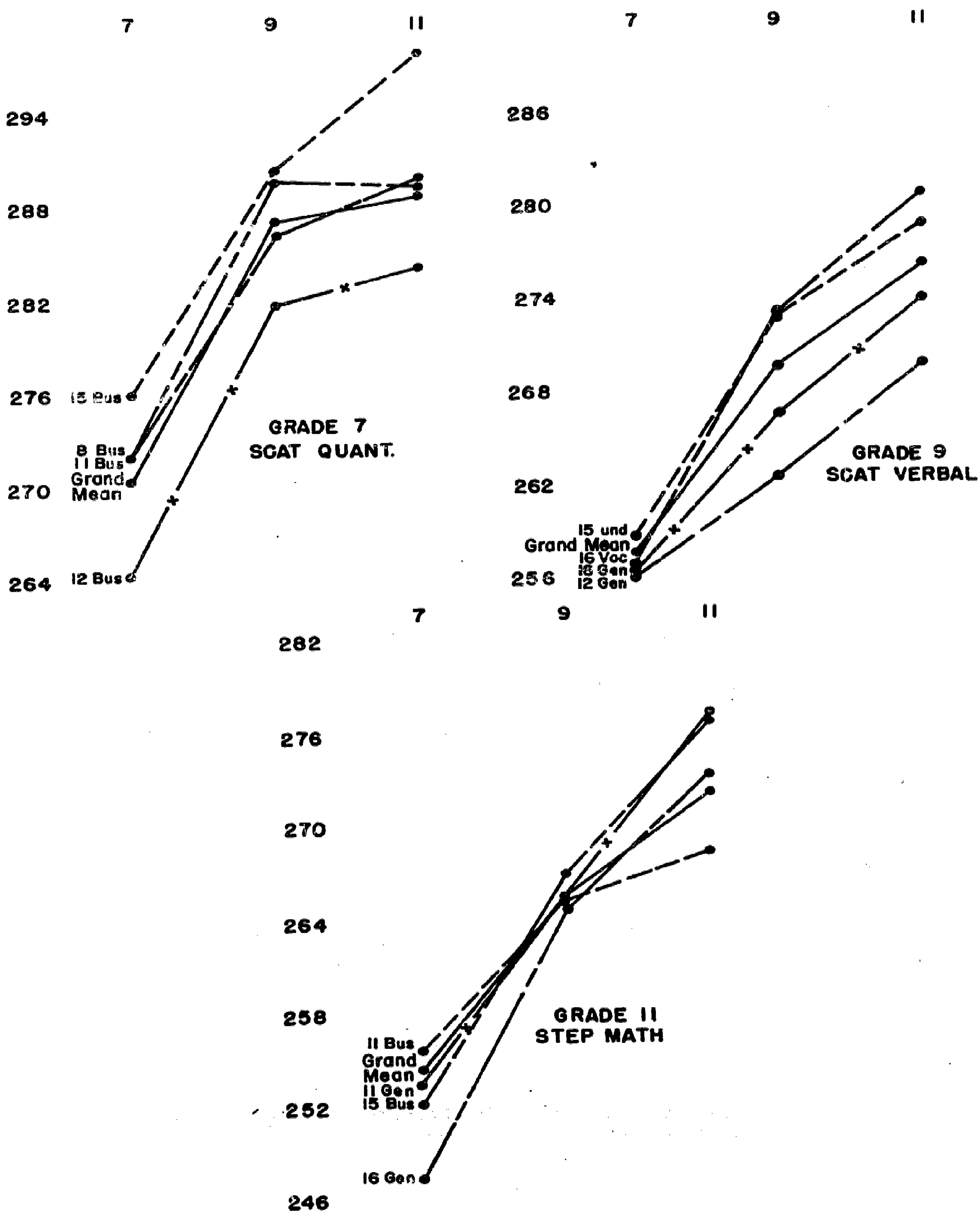


Figure 12. Plot of unadjusted mean scores associated with School-Curriculum interaction.

component coefficient of -.545 for SES and -.445 for SCAT Quantitative, this interaction effect is most pronounced among students who later attend four of the 18 schools (i.e., 15, 8, 11 and 12) and enroll in the business curriculum. At grade 9 three small but significant multivariate F ratios were found, and the first ($F = 1.693$, df 243/24,368, $p < .001$) is associated with a discriminant function defined primarily by SCAT Verbal and STEP Reading. At grade 11 four significant discriminant functions were associated with the school-curriculum interaction, the first of which ($F = 1.768$, df 243/24,317, $p < .001$) is defined predominantly by the STEP Math variable. Figure 12 illustrates these achievement differences for those schools and curricula where this relationship is most extreme on the first discriminant function at grades 7 (SCAT Quantitative), 9 (SCAT Verbal) and 11 (STEP Math).

Performance and Curriculum Group Identification

The largest and most interesting F ratios that occurred in the analyses of these data were those associated with the curriculum, sex and school factors. In Tables 10, 11 and 12, results associated with the curriculum factor at grades 7, 9 and 11 are reported. In Table 10 it can be seen that at grade 7 two significant discriminant functions occurred on which the students can be distinguished. Figure 13 illustrates the relative distance among the 7th grade discriminant scores of those students who are later to enroll in the different curricular groups.

The coefficients of the principal components in Table 10 provide an indication of which variables can be used to construct a cautious interpretation. The first might be named general achievement, since all the coefficients except SES are large. The second would appear to be a positive science-negative SES dimension. In any case, the first multivariate F ratio suggests that at the beginning of grade 7, students who later enroll in academic curricular programs are to be distinguished from all of those who later enroll in non-academic programs in regard to overall achievement. For achievement in science and the quantitative area, the second significant multivariate F indicates that within the non-academic groups the vocational group is to be distinguished, particularly from the general group. Using mean scores on the STEP Science test, first to illustrate the difference between the academic and non-academic groups, and then to show the difference between the vocational and other non-academic groups, Figure 14 reports this information for all three grades. Apparently, students with lower SES scores who enroll in a vocational program are apt to do better on STEP Science than students who also have lower SES scores but who enroll in other non-academic programs.

The results in Table 11 suggest that when grade 7 data are included as covariates in the grade 9 analysis, the continuing significance of the curriculum factor indicates that some students (e.g., those later identified with the academic curriculum) are gaining at a faster rate than others between grades 7 and 9. Again, the first

Table 10

Results Associated with Curriculum Factor at Grade 7

Test of Roots	Multivariate F	df	p less than
1 through 4	28.218	36/10,693	.001
2 through 4	1.655	24/8,334	.023

Variable	Univariate F Tests (df 4/2,861) F	p less than	Principal Component Coefficients 1	2
STEP Math	170.62	.001	.785	.291
STEP Science	147.47	.001	.728	.434
STEP Social Studies	165.66	.001	.775	-.038
STEP Reading	193.67	.001	.838	-.065
STEP Listening	160.77	.001	.763	-.132
STEP Writing	176.55	.001	.799	.196
SCAT Verbal	187.52	.001	.824	-.115
SCAT Quantitative	144.95	.001	.721	.336
SES	61.18	.001	.466	-.422

Table 11

Results Associated with Curriculum Factor at Grade 9[a]

Test of Roots	Multivariate F	df	p less than
1 through 4	8.998	36/10,663	.001
2 through 4	3.104	24/8,311	.001
3 through 4	2.355	14/5,692	.003

	Univariate F Tests (df 4/2,853)		Principal Component Coefficients		
Variable	F	p less than	1	2	3
STEP Math	16.80	.001	.484	.216	.290
STEP Science	11.73	.001	.425	-.024	-.152
STEP Social Studies	12.46	.001	.395	-.211	.537
STEP Reading	15.74	.001	.447	-.433	.099
STEP Listening	13.12	.001	.383	.525	.391
STEP Writing	16.94	.001	.491	-.272	.332
SCAT Verbal	17.68	.001	.499	.368	-.172
SCAT Quantitative	25.06	.001	.619	-.092	-.257
SES	20.97	.001	.567	-.031	-.014

[a]Adjusted for grade 7 STEP and SCAT scores

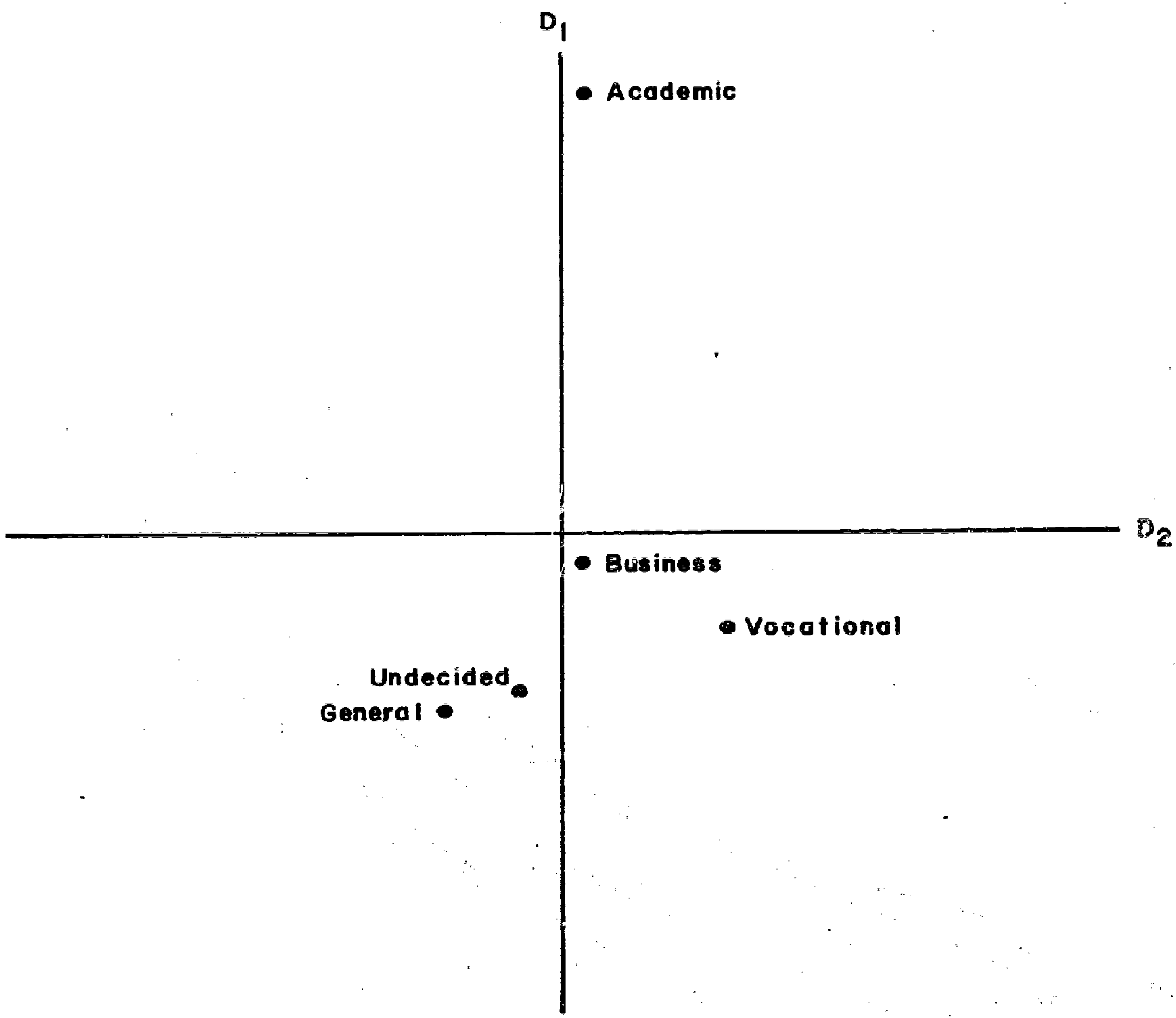
Table 12

Results Associated with Curriculum Factor at Grade 11[a]

Test of Roots	Multivariate F	df	p less than
1 through 4	5.530	36/10,633	.001

	Univariate F Tests (df 4/2,845)		Principal Component Coefficients
Variable	F	p less than	1
STEP Math	5.793	.001	.283
STEP Science	6.081	.001	.354
STEP Social Studies	9.644	.001	.473
STEP Reading	8.291	.001	.421
STEP Listening	5.556	.001	.331
STEP Writing	14.334	.001	.567
SCAT Verbal	9.193	.001	.460
SCAT Quantitative	7.636	.001	.405
SES	18.420	.001	.660

[a]Adjusted for grade 7 and 9 STEP and SCAT scores



D_1 = General Achievement and Ability

D_2 = Science Minus SES

Figure 13. Plot of discriminant scores for curriculum factor at grade 7.

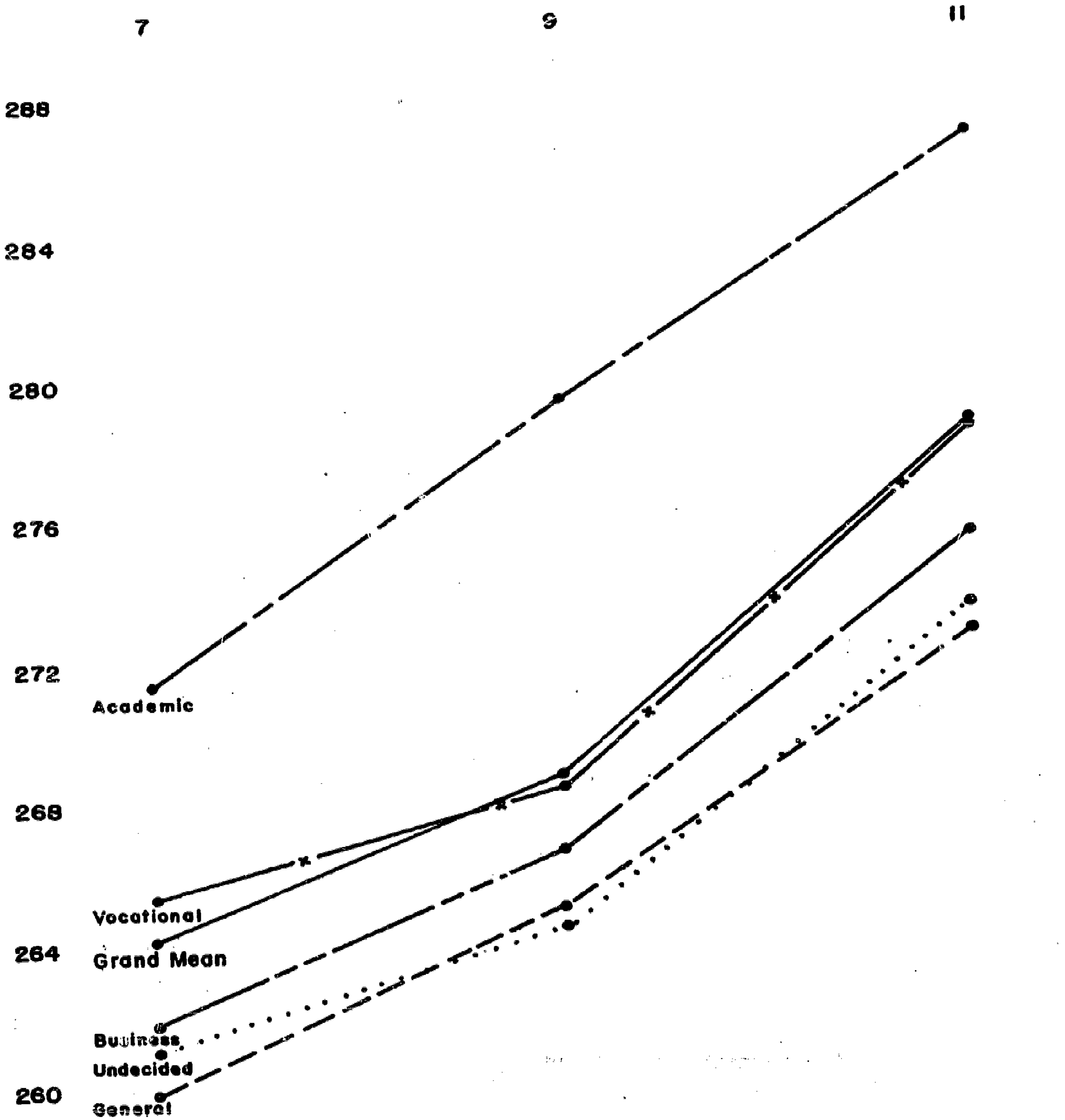


Figure 14. Plot of unadjusted STEP Science mean scores associated with curriculum factor.

discriminant function at grade 9 differentiates the academic from the non-academic groups, but this time in terms of what might be labeled achievement on SCAT Quantitative and SES, as well as general achievement. It can be stated elliptically that when scores on SES were controlled by covariance analysis a rerun of the MANOVA, this discriminant function retained its significance ($F = 7.479$, df 32/10, 493, $p < .001$) and identity. The second and third discriminant functions both separate the vocational curriculum students from other non-academid groups. In the case of the second discriminant function in Table 11, the vocational group is clearly different from the business and undecided groups on what can be identified as a positive STEP Listening-negative STEP Writing dimension. The third discriminant function at grade 9 again separates out the vocational students, particularly from the general curriculum students, on a dimension apparently dominated by STEP Social Studies. In this case, the vocational group's performance on this variable is clearly the lowest. Figure 15 illustrates the discriminant scores for each curriculum group on each discriminant function at grade 9.

The significance of the curriculum factor at grade 11 (see Table 12) again indicates that some curriculum groups continue to increase at a more rapid rate than others. The discriminant function at grade 11 again separates the academic group from the non-academic groups, now on a dimension whose principal component coefficients for SES and STEP Writing are the largest. When SES was treated as a covariate in a re-analysis of these data, two significant functions occurred, and the first ($F = 3.920$, $p < .001$) still retained its identity as a dimension on which STEP Writing was predominant.

Performance and Sex Identification

Not surprisingly for data of these kinds, the multivariate F ratios associated with the sex factor were significant at grades 7, 9 and 11. Table 13 includes the MANOVA results associated with this factor at all three grades, and Figure 16 illustrates some variables on which the sexes are considerably different from each other.

At grade 7 the discriminant function (see Table 13) is dominated by a negative principal component coefficient of -.460 for STEP Writing. When grade 7 data are included as covariates in the MANOVA of grade 9 data, it can be seen in Table 13 that significant differences still occur between the sexes, and reference to Figure 16 would suggest that, on STEP Writing at least, this significance is due to the girls having gained more relative to the boys. While STEP Writing again has the highest principal component coefficient (-.629), STEP Reading also shows evidence of contributing to the differences in achievement between boys and girls at grade 9 (see Figure 16 and Table 13).

When the data are adjusted by covariance analysis for grades 7 and 9 data in the MANOVA of grade 11 data, significant differences between the sexes are still seen to occur. This is again especially true on the STEP Writing variable, and again in favor of the girls. Beginning about six points ahead of the boys at grade 7, the girls increase this

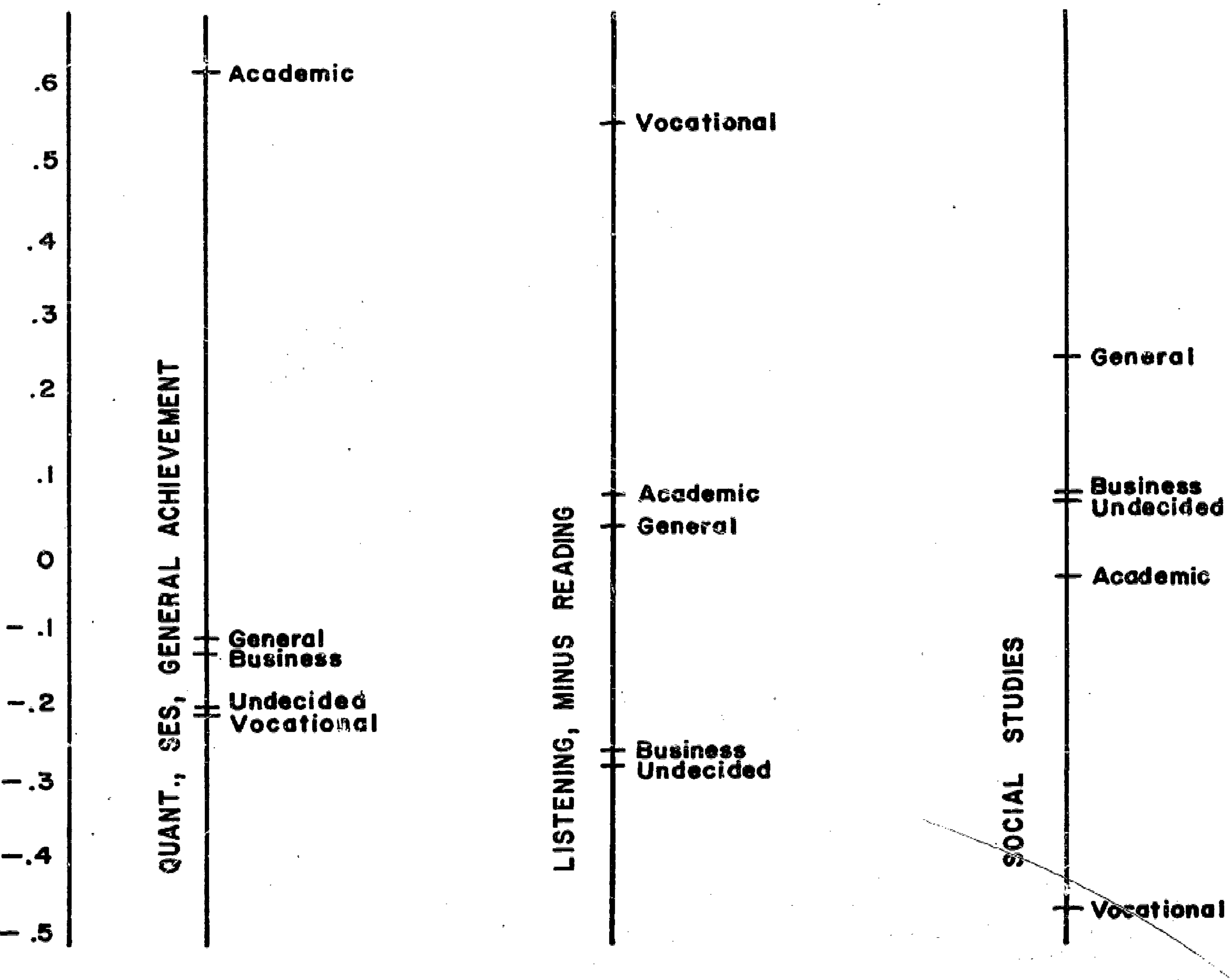


Figure 15. Plot of discriminant scores for curriculum factor at grade 9.

Table 13

Results Associated with Sex Factor
at Grades 7, 9[a] and 11[b]

Test of Roots	Multivariate F	df	p less than
Grade 7	94.776	9/2,853	.001
Grade 9	51.847	9/2,845	.001
Grade 11	46.005	9/2,837	.001

	Grade 7			Grade 9			Grade 11		
Variable	Univariate F (df 1/2,861)	p less than	Principal Components	Univariate F (df 1/2,853)	p less than	Principal Components	Univariate F (df 1/2,845)	p less than	Principal Components
STEP Math	31.336	.001	.191	38.727	.001	.288	107.737	.001	.509
STEP Science	68.227	.001	.282	35.832	.001	.277	69.245	.001	.408
STEP S.S.	2.280	.131	.052	12.834	.001	.166	38.90[illegible]	.001	.306
STEP Reading	65.952	.001	-.278	82.016	.001	-.419	25.131	.001	-.246
STEP Listening	1.063	.303	.035	4.029	.045	-.093	11.420	.001	-.166
STEP Writing	180.764	.001	-.460	185.371	.001	-.629	93.054	.001	-.473
SCAT Verbal	.444	.505	-.023	5.195	.023	.105	.751	.386	.043
SCAT Quant.	.836	.361	.031	2.647	.104	.075	24.709	.001	.244
SES	7.719	.005	.095	3.108	.078	.081	1.133	.287	.059

[a]Adjusted for grade 7 data

[b]Adjusted for grade 7 and 9 data

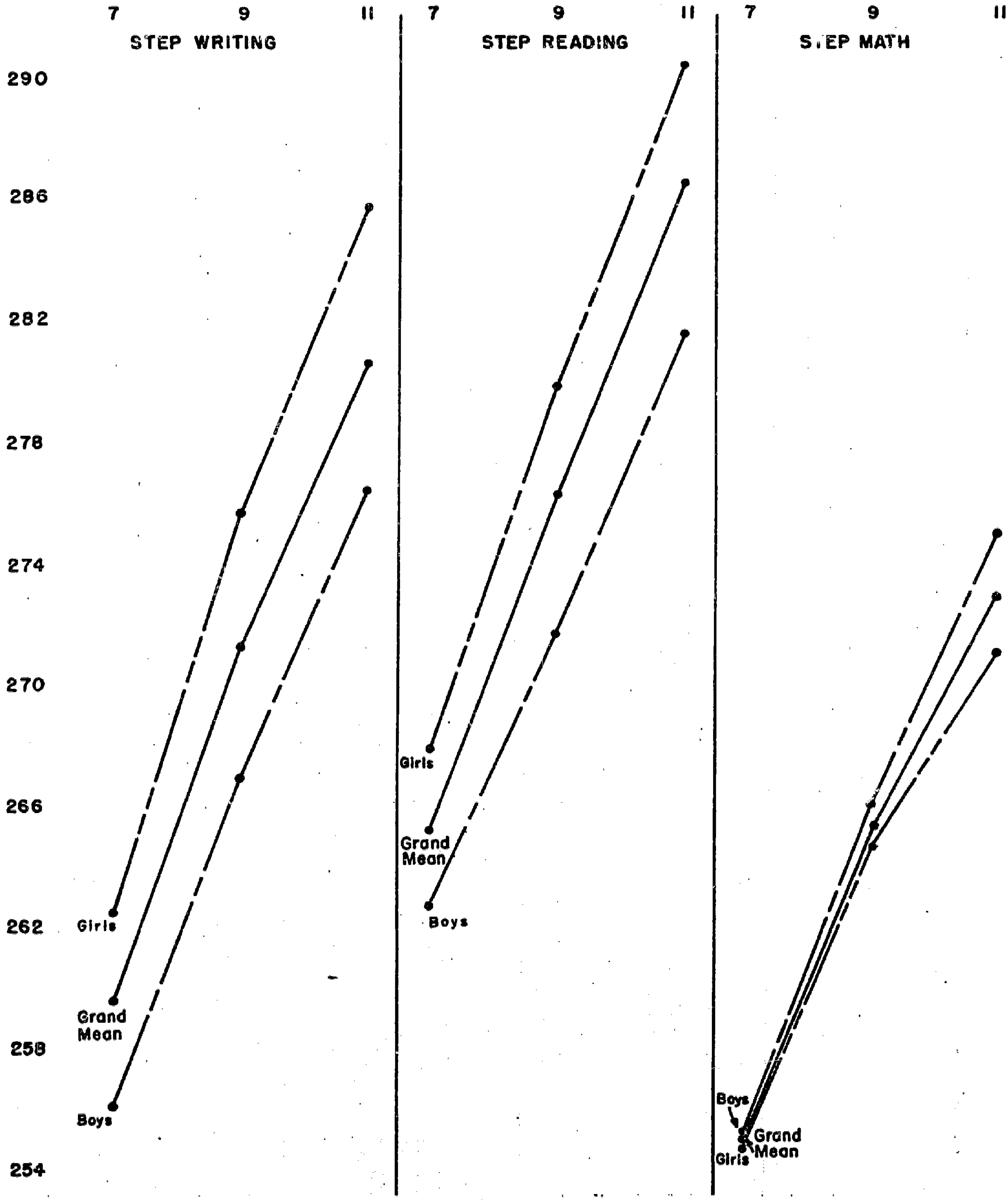


Figure 16. Plot of unadjusted mean scores associated with sex factor.

distance to nine points at grade 11. The boys, however, now appear to do significantly better than the girls on STEP Math ($p < .001$) and STEP Science ($p < .001$). The increasing differences between the sexes on STEP Math are illustrated in Figure 16.

<u>Performance and Identification by School Attended</u>

Table 14 contains the results of testing the significance of the differences associated with the high school factor on grade 7 data. From Table 14 it can be seen that there are seven significant discriminant functions, each of which defines a rank ordering at grade 7 for the groups of students who later attend one of the 18 high schools. Thus, at grade 7, the educational achievement, scholastic ability and SES of the students appear as presented in Figure 17 where the plots of the discriminant scores on the first seven dimensions are given tentative interpretation. That dimension at grade 7 which best discriminates (see D_1 in Figure 17) among students who later attend one of the 18 high schools appears to be a combination of SES and general achievement. (The reader will recall that after covarying scores on the SES variable a significant F ratio for the school factor still remained, and in that re-analysis the first discriminant function ($F = 9.534$, $p < .001$) could still be clearly identified as a general achievement dimension.)

The widest contrast in the distribution of the discriminant scores on the first dimension is between those from groups 9, 15 and 1 with higher SES scores, and those from groups 3 and 7 with lower SES scores. The second discriminant function, with large positive coefficients for reading and verbal achievement and a large negative coefficient for SES, appears to distinguish between groups which, at the high end, are generally lower on the SES variable, and those, at the lower end, which have higher SES scores.

When grade 7 STEP and SCAT scores are introduced as covariates in the MANOVA of grade 9 data, significant differences that were not predictable from knowledge of grade 7 results occurred, and are reported in Table 15. Seven discriminant functions were significant, and from the coefficients of these principal components tentative interpretations have been made, and the discriminant scores plotted in Figure 18. In Figure 18 it can be seen that the first dimension which discriminates among the groups at grade 9 seems best defined by STEP Listening in combination with SES and STEP Science (see Table 15). Again, schools 1, 15 and 9 can be rated at the high end on the first function. A second independent way of discriminating among these same groups at grade 9 still includes SES but now joins with a negative contribution from STEP Listening (see Table 15 and Figure 18). To illustrate the pattern of differences on STEP Listening, the means of those schools that were most dissimilar at grade 9 have been plotted from grades 7 to 11 in Figure 19. This has been done to highlight the fact that this variable, as a dimension of significant difference among the groups, has been noted at grades 7 and 9, and will again be noted at grade 11.

Table 14

Results Associated with High School
Factor at Grade 7

Test of Roots	F	df	p less than
1 through 9	14.127	153/22,862	.001
2 through 9	7.331	128/22,569	.001
3 through 9	4.995	105/22,227	.001
4 through 9	3.579	84/21,829	.001
5 through 9	2.451	65/21,362	.001
6 through 9	2.097	48/20,812	.001
7 through 9	1.845	33/20,163	.002

	Univariate F Tests (df 17/2,861)		Principal Component Coefficients						
Variable	F	p less than	1	2	3	4	5	6	7
STEP Math	39.18	.001	.634	.409	.165	.293	-.083	-.049	-.467
STEP Science	33.53	.001	.542	.541	.143	.359	.096	.171	.161
STEP Social Studies	35.27	.001	.551	.600	-.024	.037	.380	-.303	-.193
STEP Reading	39.21	.001	.555	.720	-.042	.185	.024	-.114	.154
STEP Listening	34.52	.001	.549	.431	.572	.085	.030	-.317	.042
STEP Writing	34.08	.001	.529	.633	-.092	.085	-.308	-.063	-.208
SCAT Verbal	39.79	.001	.600	.598	.077	-.075	-.218	-.396	.179
SCAT Quantitative	38.91	.001	.648	.118	-.162	.574	-.074	-.427	-.127
SES	55.00	.001	.779	-.323	-.069	-.438	.106	.254	.090

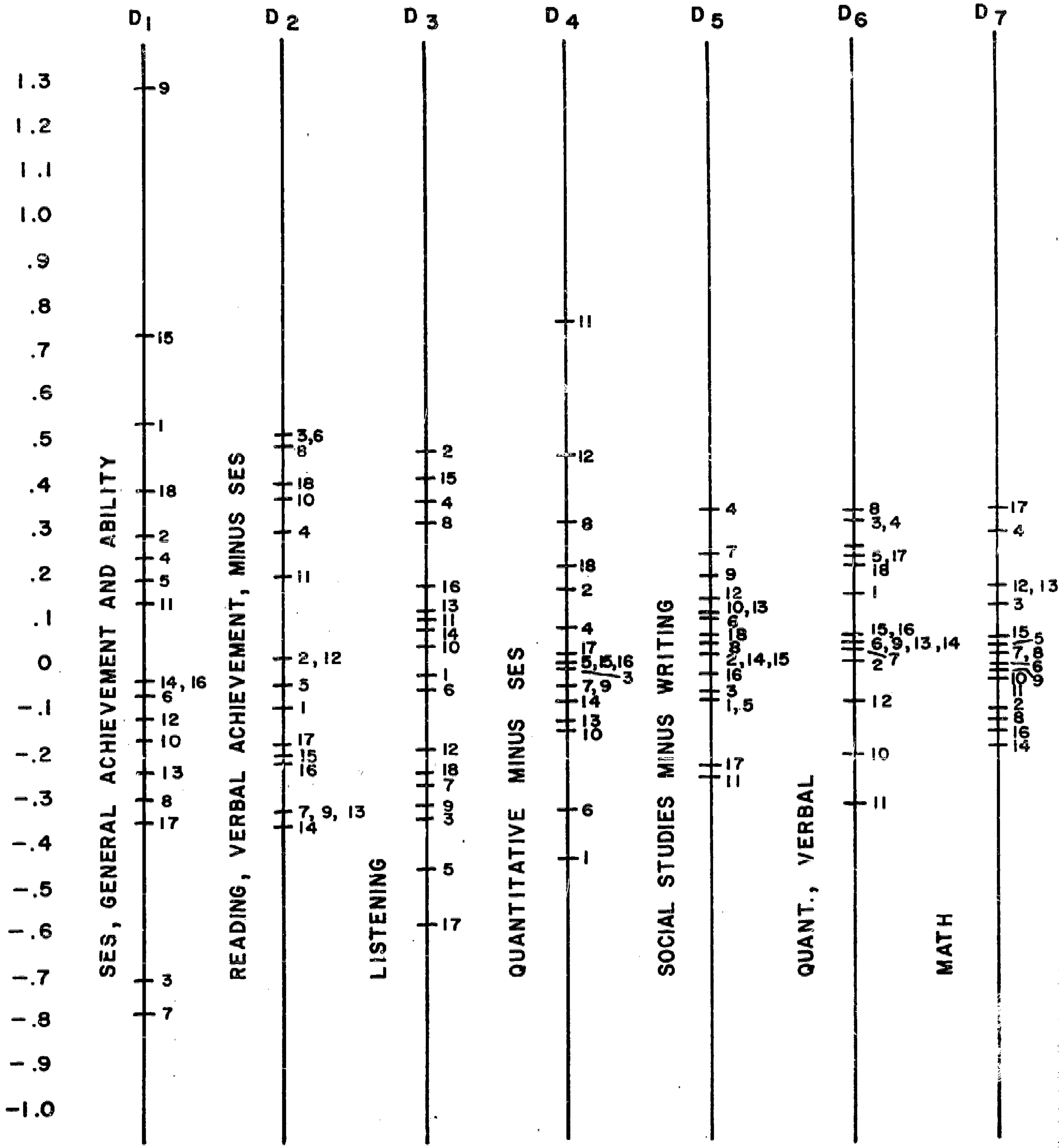


Figure 17. Plot of discriminant scores for high school factor at grade 7.

Table 15

Results Associated with High School Factor at Grade 9[a]

Test of Roots	Multivariate F	df	p less than
1 through 9	13.441	153/22,798	.001
2 through 9	8.400	128/22,505	.001
3 through 9	5.713	105/22,165	.001
4 through 9	4.338	84/21,768	.001
5 through 9	3.630	65/21,302	.001
6 through 9	2.866	48/20,754	.001
7 through 9	2.149	33/20,107	.001

	Univariate F Tests (df 17/2,853)		Principal Component Coefficients						
Variable	F	p less than	1	2	3	4	5	6	7
STEP Math	11.996	.001	.289	.099	.598	-.268	-.256	-.098	-.208
STEP Science	20.672	.001	.478	-.112	.504	.270	.347	.174	-.517
STEP Social Studies	9.478	.001	.227	-.067	.553	-.001	-.493	-.027	-.215
STEP Reading	10.395	.001	.224	.038	.592	.367	.198	-.345	.303
STEP Listening	40.425	.001	.699	-.528	.083	-.018	-.161	-.431	.046
STEP Writing	8.648	.001	.037	.172	.657	.239	-.175	-.428	.063
SCAT Verbal	7.562	.001	.190	.229	.143	-.340	.208	-.675	-.412
SCAT Quantitative	12.693	.001	.262	.037	.551	-.646	.254	.164	.321
SES	39.062	.001	.598	.714	-.255	.106	-.143	.127	.119

[a]Adjusted for grade 7 STEP and SCAT scores

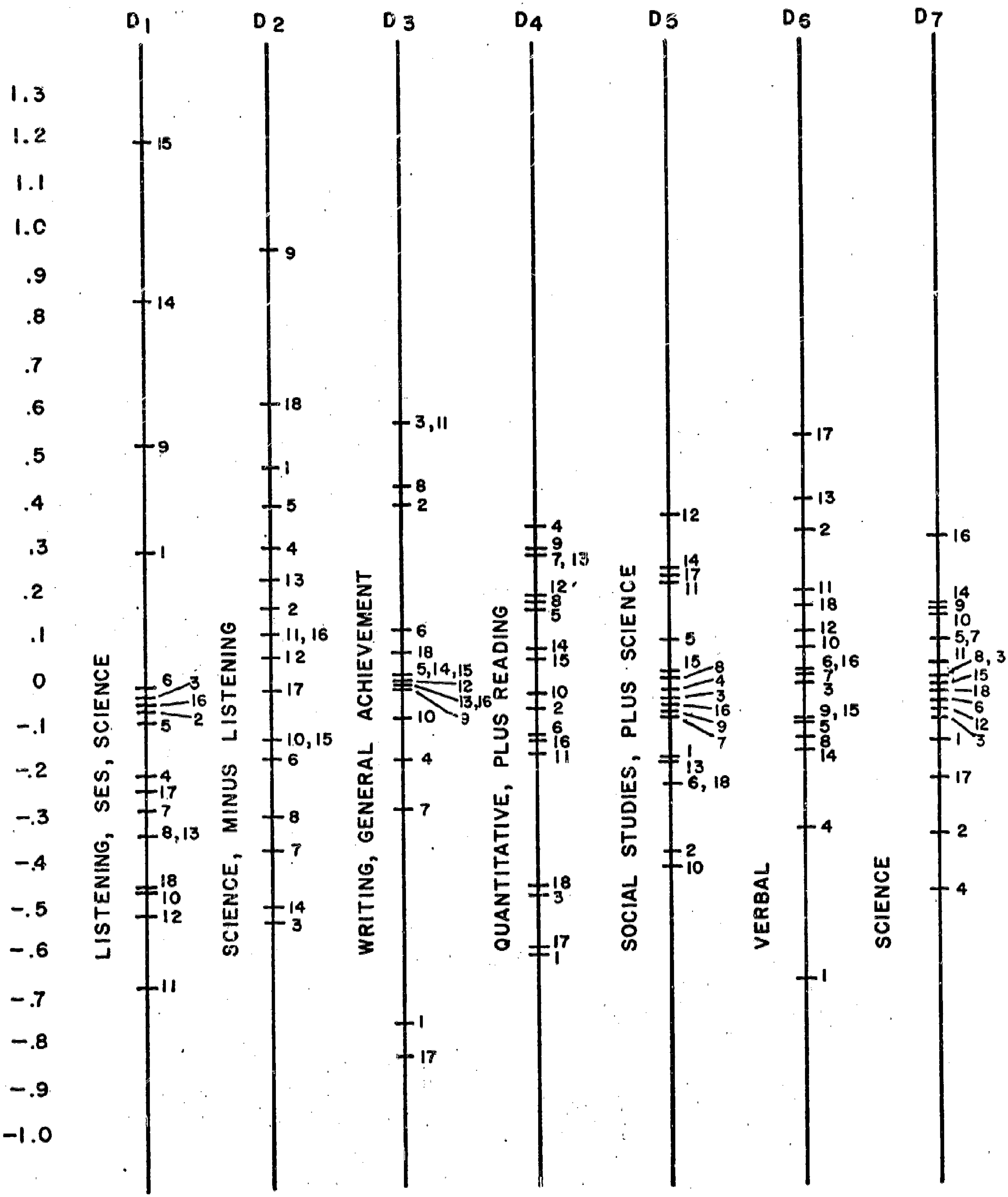


Figure 18. Plot of discriminant scores for high school factor at grade 9.

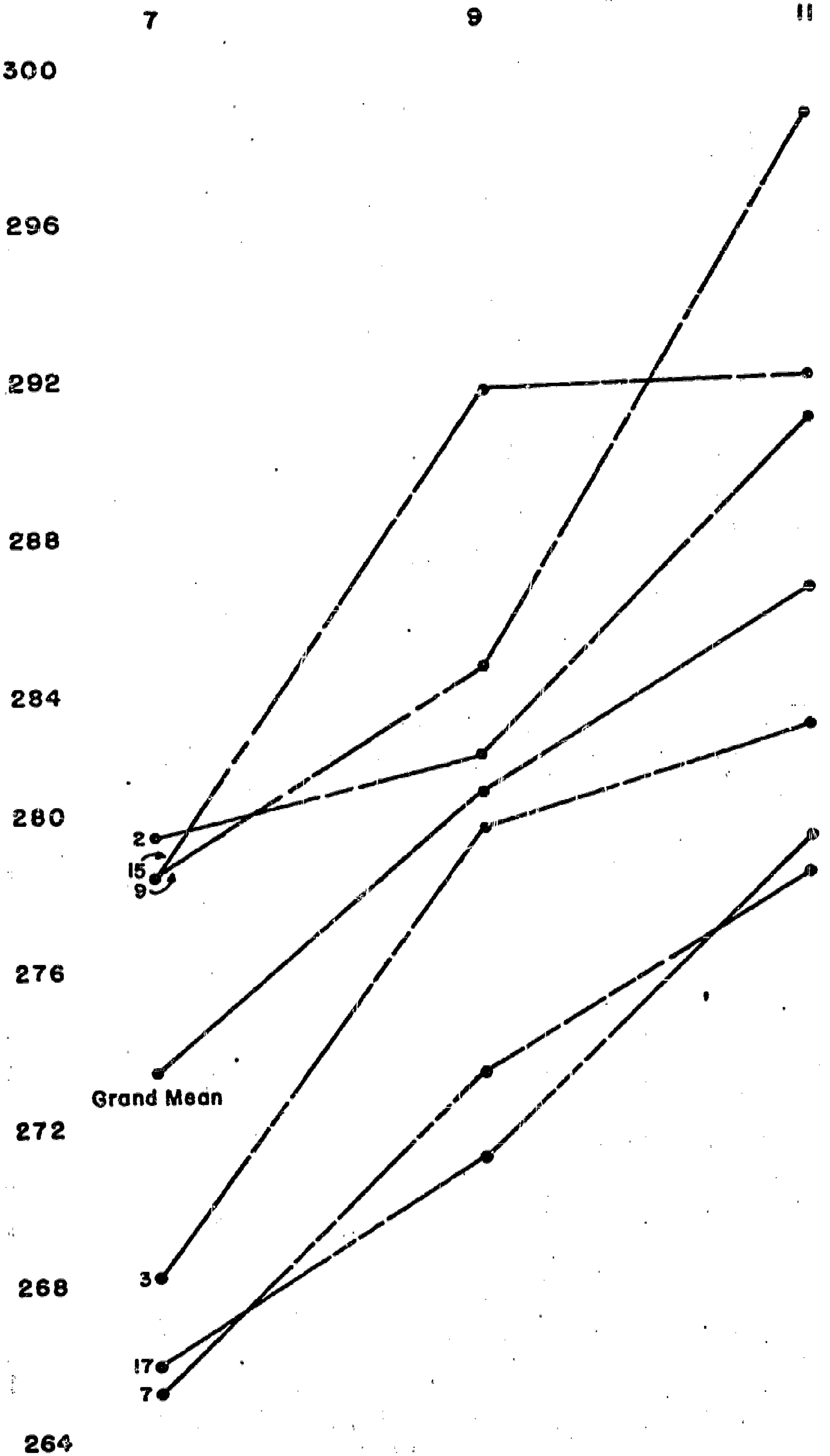


Figure 19. Plot of unadjusted STEP Listening mean scores associated with high school factor.

In Table 16 are reported the results of the MANOVA of grade 11 data adjusted for grades 7 and 9 scores. Six discriminant functions can be seen as significant. The first discriminant function has been identified here as a bipolar dimension of negative SES, positive STEP Science, followed next by a dimension identified as STEP Social Studies, Math and Science. The discriminant scores for each school group on the six significant functions at grade 11 are illustrated in Figure 20. Again, the presence of a large principal component coefficient for the STEP Listening variable is to be noted on the third discriminant function in Figure 20. In Figures 17, 18 and 20 it can be seen that it is not necessarily the same schools at any one grade which are the "outliers" on the STEP Listening dimension. The ability of this measure to contribute significantly to the ongoing discrimination among different groups is underscored.

Discussion

At grade 7 the educational achievement, scholastic ability and socioeconomic status of students who later enroll in different high school curricular programs discriminate among the students, and in doing so the nature of these attributes can be identified in a tentative way by noting the size of the principal component coefficients. That combination of variables which seems to discriminate best is a general achievement and ability dimension on which the students who later enroll in academic programs are clearly ahead of their non-academic peers (see Figure 13 and Table 15). The general achievement dimension persists through the analyses at each grade, as a means of distinguishing among the groups and describing their performance.

Less inclusive dimensions of educational achievement and background are revealed by the analyses of the curriculum factor. Differences among the non-academic students, particularly for the vocational group relative to the others, are apparent at grade 7 on a discriminant function identified by a large positive coefficient for STEP Science, and a large negative coefficient for SES (see Figure 13). The vocational students do well on STEP Science relative to the other non-academic groups, and this lead continues through grade 11. At grade 9, the students later identified with the vocational program now begin to exceed their non-academic peers on STEP Listening, and this is indicated by a new dimension defined by positive STEP Listening, negative STEP Reading (see Figure 15). STEP Social Studies also appears as a dimension of achievement at grade 9. Where the vocational group excels on STEP Listening it seems to do so at the expense of achievement in STEP Reading and Social Studies, in which they fall behind all other groups.

The educational achievement and background of the curriculum groups is first, and perhaps best, described and represented by general or overall achievement and ability in combination with SES. While the pattern of growth in achievement for the academic group appears evenly distributed across the areas covered by the STEP and SCAT tests, the same cannot be said for the non-academic groups. Their growth appears less general, and limited to such areas as STEP Science or STEP Social Studies.

Table 16

Results Associated with High School
Factor at Grade 11[a]

Test of Roots	Multivariate F	df	p less than
1 through 9	13.666	153/22,734	.001
2 through 9	10.106	128/22,442	.001
3 through 9	7.259	105/22,103	.001
4 through 9	5.160	84/21,706	.001
5 through 9	3.130	65/21,242	.001
6 through 9	2.015	48/20,696	.001

	Univariate F Tests (df 17/2,845)		Principal Component Coefficients					
Variable	F	p less than	1	2	3	4	5	6
STEP Math	14.962	.001	.124	.546	-.254	-.437	.130	-.009
STEP Science	19.161	.001	.396	.533	-.064	-.261	.259	.300
STEP SS.	20.270	.001	.031	.735	-.002	.075	-.587	-.221
STEP Reading	8.695	.001	.141	.367	-.142	.258	-.376	.481
STEP Listening	22.562	.001	-.300	.481	.697	-.139	-.069	.389
STEP Writing	6.856	.001	-.148	.234	-.293	-.092	-.317	.668
SCAT Verbal	3.364	.001	-.032	.158	-.054	-.125	-.412	.397
SCAT Quant.	11.520	.001	-.150	.030	-.110	-.795	-.435	-.010
SES	35.961	.001	-.768	.275	-.392	.123	.310	-.029

[a]Adjusted for grade 7 and 9 STEP and SCAT scores

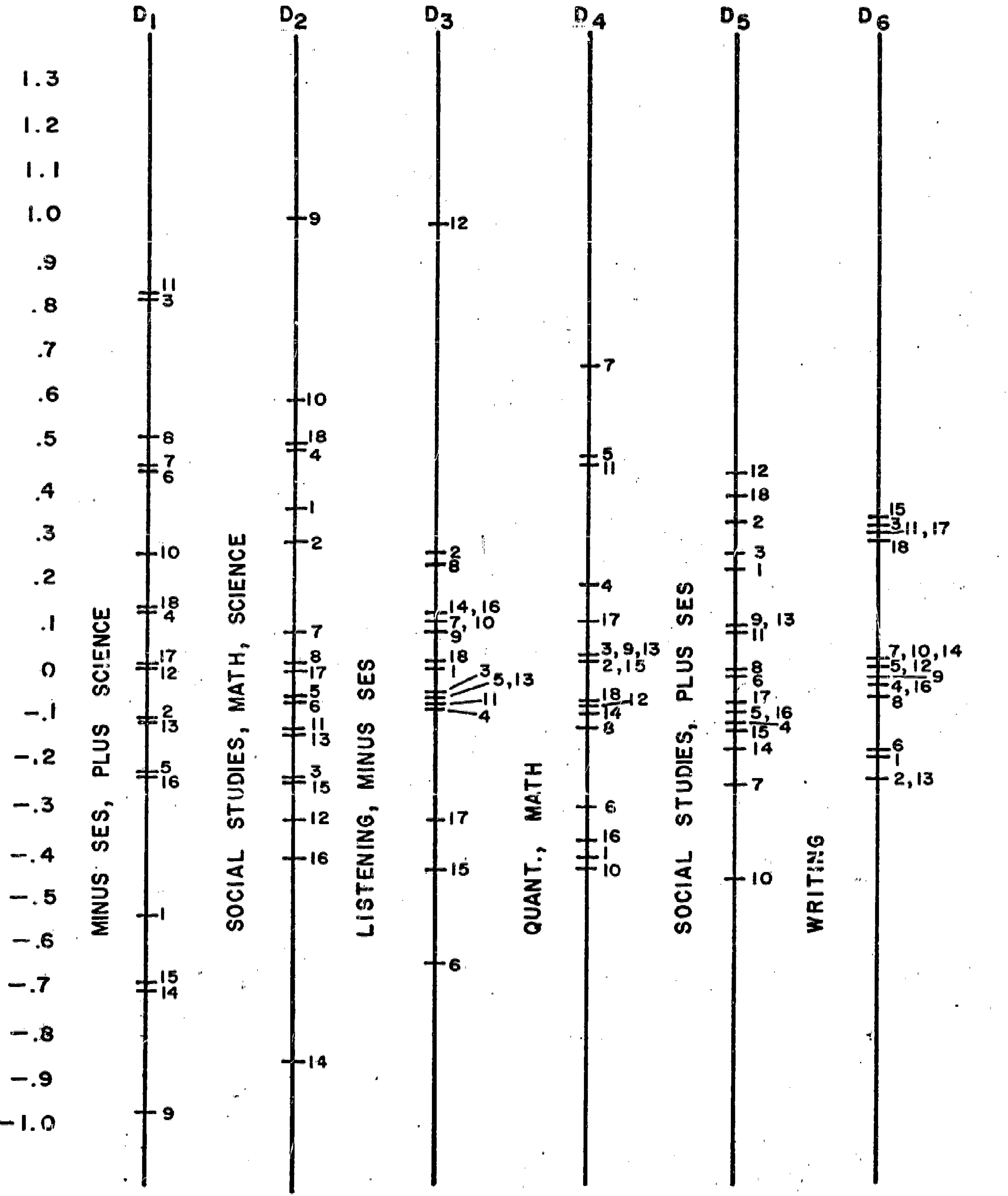


Figure 20. Plot of discriminant scores for high school factor at grade 11.

Achievement differences beyond those noted among the curriculum groups at grade 7 were observed at grades 9 and 11, although when prior STEP and SCAT scores were introduced as covariates these latter achievement differences became smaller. Conversely, the SES variable becomes increasingly more effective in contributing to the discrimination among the curriculum groups (see Tables 10, 11 and 12).

One implication of the main effect of the curriculum factor at all three grades for the vocational and educational guidance of such students, is the significantly lower achievement of the non-academic groups. Not only is their performance uniformly lower, but it is also more uneven. The practical importance of such differences in the rate and nature of intellectual growth among students in different curriculum groups lies in the need to re-think the kind of education it is we want non-college-bound students to receive, and whether or not such present performance reflects the expectations and attitudes of the educational community toward these students (cf. Rosenthal, 1966). If the vocational development of students is influenced both by their own and others' evaluation of their past educational achievement, and by the curriculum in which they are enrolled, the performance of the non-academic students in this study needs to be held in question.

The significance of the school factor at grades 7, 9 and 11 (see Tables 14, 15 and 16) further reveals the nature of educational achievement, ability, and background during these grades, as well as the diversity that exists among the several school groups. At grade 7 the students' performance was characterized by seven different dimensions, the first of which suggested that SES and overall or general educational achievement and ability were most representative (see Figure 17). In this case, school groups with higher SES scores (e.g., 9, 15 and 1) were located toward the high end of the discriminant score distribution. A second dimension at grade 7 appeared to discriminate among the school groups with lower SES scores, and this was defined as a positive STEP Reading, verbal achievement, negative SES dimension. Seventh grade students were further characterized both by a positive STEP Listening and a positive SCAT Quantitative, negative SES dimension.

When 7th grade STEP and SCAT scores were introduced as covariates in the MANOVA of grade 9 data a STEP Listening, SES, STEP Science dimension occurred, suggesting now that the performance of the students is best represented in a more specific manner (see Figure 18). Again students in those school groups with the highest SES scores (15, 9 and 1) are located at the high positive end of the discriminant score distribution. A bipolar dimension of positive SES, negative STEP Listening also represented the student's 9th grade performance, as did a dimension of STEP Writing, general achievement. These and other 9th grade findings imply that some school groups made greater gains in achievement than others (especially 15, 14, 9, 1, 18, 3 and 11).

The 11th grade performance of the students further reveals the kind of attributes that characterize their achievement and background. After including grades 7 and 9 STEP and SCAT scores as covariates in the grade 11 MANOVA, it became clear that a bipolar dimension identified as positive SES vs. negative STEP Science is the attribute that best describes the students (see Figure 20). In doing so, it reverses a previous trend by locating school groups with lower SES scores at the top of the first discriminant score distribution, and this finding suggests that some of the lower SES school groups (e.g., 11, 3, 8, 7 and 6) make greater STEP Science gains between grades 9 and 11 than do some of the higher SES school groups (e.g., 9, 14, 15 and 1). A second dimension at grade 11 further specifies the nature of achievement which characterizes these students. A STEP Social Studies, Math and Science dimension locates those school groups (e.g., 9, 10, 18 and 4) who appear to have made greater gains (i.e., in STEP Social Studies) from grades 9 to 11 than other school groups (e.g., 14, 16, 12, 15 and 3). A positive STEP Listening, negative SES dimension again adds to the description of this group's educational achievement at grade 11 and implies that some lower SES school groups (e.g., particularly 12) generally make greater gains in STEP Listening than do the higher SES groups (see schools 6 and 15 on D_3 in Figure 20).

Those attributes which appear, then, to best characterize this sample of students at each grade are, until grade 11, those on which generally higher SES groups do better. In general, lower SES school groups seem to perform at a higher level of achievement on more specific than general attributes, and while a few higher SES schools (e.g., 1, 9 and 15) are always ahead in terms of mean score, some lower SES schools (e.g., 11, 7 and 3) make greater gains in achievement over time. The educational achievement of the various school groups does appear to change, as shown by these data, from the general to the more specific although, in absolute terms, the differences among school groups on any one dimension get progressively smaller from grades 7 to 11. Even so, the differences that remain among the groups at grade 11 are still of practical educational importance, especially in STEP Listening, Social Studies, Science and Math.

The way in which the school itself might contribute to the differences noted in this research was not a focus of the investigation. Yet, the pattern of performance of the different school groups at grade 11 argues for the mediating influence of the school upon the vocational and intellectual development of students. How to obtain impartial understanding of what the school does to and for students has been presented in an evaluative scheme by Dyer, Linn and Patton (1968) and the present study underscores the need to obtain such understanding.

Summary and Conclusion

A multivariate analysis of variance (MANOVA) was performed on the STEP, SCAT and socioeconomic (SES) scores of 2,952 Growth Study subjects at grades 7, 9 and 11. The subjects were grouped using grade 11 information according to 5 curricula, 2 sexes and 18 high schools so that the MANOVA of grades 7, 9 and 11 data was accomplished using these factors as design parameters.

The findings indicate that at each grade the school, curriculum and sex factors were each associated with significant multivariate F ratios. As early as grade 7, meaningful differences in the performance and background of these subjects were apparent. For example, at grade 7 the performance of students who later enrolled in an academic curriculum was seen to be considerably higher than that of all non-academic groups, and was characterized primarily by a general achievement discriminant function. Among the non-academic groups, the vocational curriculum students were distinguished from their other non-academic peers in terms of performance on STEP Science and low SES, a trend that continued through grade 11. In general, it was found that the academic curricular group exhibited evenly distributed achievement across the areas covered by the STEP and SCAT tests from grades 7 to 11. The on-going achievement of the non-academic groups appeared less uniform with higher achievement noted on STEP Science and Social Studies.

The school factor was observed to distinguish significantly among the school groups at grade 7 in seven different ways. The first function was, however, a general achievement-SES dimension. The first discriminant function at grade 9 was interpreted as a STEP Listening--SES--STEP Science dimension where schools with high SES scores were ranked at the high positive end of the first discriminant score distribution. A more specific performance dimension characterized the first discriminant function at grade 9 and was given tentative interpretation as STEP Listening--SES--STEP Science. At grade 11 a positive SES, negative STEP Science dimension was the first discriminant function.

The attributes which appeared to best describe the sample of students at each grade were, until grade 11, those on which higher SES groups did better. However, some lower SES groups made greater achievement gains over time than did higher SES groups. The differences that wer found to remain among school groups at grade 11 are of practical educational importance, especially in the achievement areas covered by STEP Listening, Social Studies, Science and Math.

Chapter 7

The School and Community as Factors in Student Achievement

Patricia L. Casserly and William E. Coffman[1]

A complex pluralistic society such as ours, founded on democratic principles and recognizing the importance of each individual in the society, assigns a myriad of formidable functions to its public schools. The school is expected to concern itself with the development of intellectual skills and with the transmission of knowledge. That is taken for granted. In addition, it is called upon to assume a variety of functions which in a simpler society might be assumed by other agencies. Since the late 1960's, for example, it has been expected to compensate for "injustices" experienced by children before they begin their formal education, cultural inequalities experienced because of limitations of family background, community disorganization, or economic deprivations. To a considerable extent, the school is asked to assume responsibility for the broad intellectual and personal development of individuals, not simply for teaching the traditional organized subject matter. The extent of the expectation is illustrated in the following set of goals drawn up by the State Board of Education of the Commonwealth of Pennsylvania (Educational Testing Service, 1965, pp. 10-13):

I. To help every child acquire the greatest possible understanding of himself and an appreciation of his worthiness as a member of society.

II. To help every child acquire understanding and appreciation of persons belonging to social, cultural, and ethnic groups different from his own.

III. To help every child acquire to the fullest extent possible for him, mastery of the basic skills in the use of words and numbers.

IV. To help every child acquire a positive attitude toward school and toward the learning process.

V. To help every child acquire the habits and attitudes associated with responsible citizenship.

VI. To help every child acquire good health habits and an understanding of the conditions necessary for the maintenance of physical and emotional well-being.

VII. To give every child opportunity and encouragement to be creative in one or more fields of endeavor.

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[1] Now at the University of Iowa.

VIII. To help every child understand the opportunities open to him for preparing himself for a productive life and to enable him to take full advantage of these opportunities.

IX. To help every child understand and appreciate as much as he can of human achievement in the natural sciences, the social sciences, the humanities, and the arts.

X. To help every child prepare for a world of rapid change and unforeseeable demands in which continuing education throughout his adult life should be a normal expectation.

In working toward such a set of goals, the school must necessarily function within the framework of the larger society. Formal education is only one of the many factors that contribute to the student's development. The child does not stop learning when he passes through the schoolhouse doors in the afternoon; to a considerable extent his motivation for pursuing school work is determined by what happens to him outside of the school. Furthermore, a variety of forces in the community will affect the ways in which each school defines "worthiness" or "well being" or "creativity" or other outcomes toward which the school is working. It is probably impossible to determine the effectiveness of any single school or school system apart from a consideration of the community of which it is a part.

There have been many attempts to assess the effectiveness of particular educational programs. In most cases, however, these attempts have focused on academic skills and knowledge. These have proved relatively easy to assess, while outcomes such as the development of creativity, personal and social adjustment, and the like have proved difficult to assess. The typical study has compared the performance of students at the end of a period of schooling on one or more achievement tests, after taking into account differences in intellectual abilities at the beginning of the period. It appears that after intellectual input is statistically controlled, some schools appear more successful than others in enhancing cognitive growth (French, 1959; also see Chapter 6); however, the studies do not enable one to understand why. Is the explanation to be found in what goes on inside the schools? Or are there factors in the community or the home that contribute more than does the school to achievements demonstrated by students?

Interest in questions such as these led ETS to undertake the Growth Study. Analyses of the data, given in Chapter 5, indicate that there are significant differences in patterns of test scores for the different schools and for groups of students enrolled in different curricula. The study reported in this chapter grew out of a recognition that more needed to be learned about the characteristics of the educational programs in the various schools than could be inferred from the responses to test and questionnaire items. Of particular interest was information about the complex pattern of school and community factors as they affected the students who were not actively enrolled in college preparatory programs. To what extent could different community and school climates be identified? If there were different climates, how were they related to the achievement and adjustment of students, particularly of those students who were likely to be entering the adult world of work directly from the secondary school?

During the winter and spring of 1968 several members of the ETS research staff visited 16 schools across the nation. Observation and focused interviews were used in an attempt to provide a more complete picture of each school's educational program in the context of the total school-community context. We did not presume, through these visits alone, to answer questions about the effects of programs, schools and communities. Rather, the expectation was that hypotheses could be developed that would enable a better understanding of previous analyses and, of greater significance, could provide a framwork for future analyses that might be used to test these hypotheses.

We assumed throughout that programs for "nurturing those abilities, attitudes and habits of thought and action which make for responsible citizenship, vocational effectiveness and maximum personal development" may differ greatly from school to school, or even within schools, and still be highly effective (Peterson, 1968, Chapter I). Thus, we weren't looking for the ideal program. Rather, we were looking for patterns of activity inside and outside of school that seemed to students and to their teachers and counselors to be valuable in fostering both vocational maturity and academic progress.

The purpose of this paper is to present in some detail our methods of collecting data, and then go on to a description of three of the secondary schools we visited. Let's call them Richton, Junction City, and Plainsville, although those are not their actual names. They represent three variations of the triadic relationship between students, the school, and the community; variations that we also observed in a number of other communities we visited, and that seem to warrant particular attention.

It should be understood that although a few of the visits were made to schools located in large urban centers, no attempt has been made to include data from those visits in this analysis. We deliberately limited this analysis and interpretation to the data from schools located in small, relatively self-contained communities with populations of six to 12 thousand. Some of our observations and hypotheses may apply to schools in large urban centers; however, we recognize that such schools face a whole complex of problems not found in the schools described in this report.

In the fall of 1967 a detailed interview schedule was developed and pretested on representatives of the Growth Study schools who attended a meeting in Princeton. The first section of this schedule contained questions designed to elicit detailed demographic information about the communities in which the schools were situated. Section II dealt with the curricular and social structure of the school, e.g., What is the school's experience and policy on potential dropouts? On tracking or homogeneous grouping? Do non-college-bound students share classes with those in the acad mic curriculum? How much social segregation is there between students in the various curricula? Section II was concerned with counseling procedures for students in technical and vocational programs. We were interested in discovering at what times curricular choices were made, and on what basis, and how flexible these choices were once a student was enrolled in a program.

During the pilot interviews the school representatives were encouraged to tell us what made their schools unique, e.g., Were there special problems in the school or community of which we ought to be aware? Were there special facilities or programs within the school of which they were particularly proud? In short, the representatives were asked to tell us what they would like the researchers to be particularly aware of during their visits to the schools.

The interview schedule in its final form can be found as Appendix . Although each visit to a school lasted only a day or a day and a half, most interviewers managed to talk with a number of different people who might be expected to provide different perspectives: the school principal, and sometimes the superintendent, guidance counselors, teachers representing both vocational-technical and academic curricula, and students. Each visitor talked with six different students who had been chosen at random from lists available at ETS, not by officials of the school. Most of them were enrolled in non-academic curricula. In addition, the visitors inspected shops and laboratories, and some of them were able to sit in on a class or two and to hold group interviews in those classes.

Although the visits were much too short to give us anything but "snapshots" of particular schools on particular days--rather than well-constructed documentaries over time--we were able to identify some problems that seem common to all schools and thus are able to report on a variety of solutions to these problems and to make tentative hypotheses about the strengths and weaknesses of various treatments of students who are engaged in one form or another of non-academic training.

The Three Schools and Communities

Richton. The school in Richton has an enrollment of approximately 700 students in a modern, well-equipped building. There are unusually well-equipped laboratories for both academic and vocational courses; for example an electronic shop, equipped with 10 oscilloscopes. The staff of more than 50 teachers and three guidance counselors is highly trained. More than half have advanced training beyond the master's degree. The school is located in a stable, middle-income, suburban and semirural community of 10,000 situated less than 50 miles from a large industrial and cultural center. The school population is predominantly third generation Americans of European extraction; only about 10% are descendants of the original settlers of the area. Most of the parents of the students own small businesses and shops, or work at skilled occupations within the community. Only a small percentage, including some professionals and writers, commute to the metropolis. There are very few unemployed adults within the community, and many openings exist at all occupational levels within easy commuting distance.

As taxpayers, the residents of the community are generous with funds for the school, and in turn expect the school to take full responsibility for the education of their children. They interfere not at all with the running of the school--do not participate in PTA or come to special school programs such as "career days" or "plan for college nights." Furthermore, they appear to do little at home to increase the motivation of their children; that, too, they expect the school to take care of.

This attitude of "we provide the money, you educate the kids" has some advantages for the innovative staff and administration. They have been able to run rather sophisticated programs--in the exploration of drug abuses and in sex education, "T-groups" for underachievers and the gifted, and mock political conventions--with no complaints from parents or community leaders. They are also innovative in such programs as a splendid interdisciplinary humanities course of the non-college-bound, who are segregated in academic as well as non-academic work in this school. According to the program coordinator, the course is one which teaches

> man's sense of value and senses of the value of American culture.... As we explored the ramification of the problem we became convinced that the great need for such a course was not that of the college-preparatory students (to whom most humanities courses seem to be directed) but that of the business and terminal students--those whose formal education ends with high school. Our conclusion was that, for these students, the closest they come to a liberal arts education is what we offer them.
>
> We decided to limit our program to a close analysis of three of the crucial issues in American culture--prejudice, morality and the individual in society....With each issue, the approach was the same. How did we get here? What is happening today? And what do we do about it?

Most parents in Richton had been young adults during the depression. Those who were college graduates had struggled to find and keep jobs while attending college at night on a part-time basis, often for five to seven years in order to earn their degrees. Immediately afterwards, many served in the Armed Forces during World War II. The depression and the war effectively postponed marriage. And the creation of children was postponed until debts were paid off and one was established in business.

According to several teachers and administrators in the school, these college educated parents who would be expected to be ambitious for their children want to spare them "the struggle that we faced" either in school or later years. The children are encouraged by their parents to go to college--but they are not pushed to try for the most selective institution they might hope to attend. In most parents' minds a junior college or the state university is just as acceptable as the Seven Sisters or the Ivy League, and a lot less expensive. On the other hand, parents are generous with allowances, cars, and other of the material benefits of today's affluent society. The young people are denied little while they are in high school.

Richton school sends 72% of its students on to some type of post-secondary education: 27% to four-year colleges, 22% to two-year colleges, 2% to nursing schools, and 21% to noncollege educational institutions.

During the high school years the true dropout rate (the percentage of students lost to any further education) is only 5%. This figure might be larger were it not for two factors: the strenuous efforts of the guidance staff and simple inertia on the part of disinterested students. One student expressed it this way, "I was suspended for a day and my mother said 'Why bother to go back? You don't have to.' But I decided I might as well sit around here (in school) with my friends than home alone without them." (Notice this student said nothing about getting a job. Indeed, during the rest of the interview she stated clearly that she had no plans for the immediate future beyond having a good time.) As a group, the students seem content to take things easy, enjoying the affluence provided by prosperous parents.

Junction City. If many of the students in Richton are oriented toward conspicuous consumption, many of the students enrolled in the Junction City school are plagued by conspicuous poverty. The school of approximately 800 is situated in a once prosperous, self-contained community of approximately 8,000. Thirty-five years ago the small farms surrounding the community were economically viable for individual families whose dreams were limited by present day standards. Gradually, aspirations and economic realities changed, and large corporations bought up and consolidated the holdings of individual farmers. The town is now surrounded by large farms owned by absentee landlords. They introduced new crops to the land which required constant and reliable irrigation (an expensive undertaking). The yield is now harvested mechanically.

Thus the small farmers have been gradually pushed from their land and the unskilled or semiskilled laborers on whom they used to depend are no longer needed. For a while some of these workers could find employment in local businesses or in a plant operated by the railroad that served the town. But now only one freight stops each day. The welfare rolls have increased steadily over the last 20 years as the railroad has shifted its business to a nearby city nearly 10 times as large.

One-fourth of the population is of Mexican descent. The children of Mexican extraction now in school are often the third generation of their group to live in this town and often the second generation to be supported by welfare that, according to one informant, is "sadly, a socially acceptable way of life." The Indian and Spanish influences in the Mexican families are quite strong. To quote one of the school officials: "With the Indian's attachment to the place of his birth and the Spanish tradition of guarding unmarried daughters, it is difficult to motivate young people, particularly girls, to move out of the community to where they'd have a chance."

Because home owners, businessmen, and tradesmen are also hurt by the shutdown of the railroad's activities, the community is unwilling or unable to maintain--much less increase--its support of the schools. Teachers start at the minimum salary allowed by the state, and there is very little difference between the minimum and maximum salaries for teachers. The maximum salary attainable for a principal is under nine thousand dollars a year, and all teachers, we were informed, have second jobs.

Yet someone in the recent past, when the community was not so economically depressed, had vision. The high school is of unusual modern design--a series of white-roofed units clustered around a central core that gives the illusion of circus tents spread out on the plain. The classrooms in each unit are pie-shaped and are arranged around a special departmental library. For example, all mathematics classes are held in one unit, all English classes in another, all business classes in a third. The libraries for each subject in turn surround the appropriate teachers' offices, the rationale being that this arrangement allows a student studying in the library to get help in the subject he is studying easily and quickly. (In addition there is a main library and the usual facilities for large groups of students.)

Of special pride to the administration is the TV equipment that can relay programs from national networks, record activities in one classroom and simultaneously relay them to other classrooms, or transmit several different "canned" programs to the appropriate classrooms at the same time. Unfortunately, there is no money to hire the technician necessary to make use of this sophisticated hardware. Nor is there money for an adequate gymnasium. Physical educational classes are usually held outside, throughout the year. Fortunately, some shops and the home economics facilities were well equipped before the school ran out of funds.

The recent establishment of a junior college in the community financed by the state has proved a mixed blessing. On the one hand, it has brought a new source of income to tradesmen; on the other, it has almost exhausted the opportunities for high school students to enter the cooperative program in distributive education. College students, many from outside the community, now have the jobs that were once open to needy secondary school students. In 1968 only 15 part-time jobs were available to high-schoolers and the guidance counselor needed 75 jobs to meet the needs of his charges--both for financial and experiential reasons. "Our biggest job is to educate these people to leave the community. We can give the skills but they need the concrete experience so that they can make a go of it--to learn for themselves that they are worthwhile and that the struggle is worthwhile."

Although 61% of the graduates begin some kind of postsecondary school training, very few attend four-year colleges and aspire to a college degree. A number go to the junior college down the street; many enroll in the business curriculum, which is "far below what we offer here." Some of the high school seniors plead they can't afford even the local junior college. The guidance counselor says there are enough job opportunities at the college to enable all these students to go and pay their way. "Even so, come fall," he told us "there will be a few that I will take by the hand and march down there on foot to make sure they register." Overcoming apathy and low self-esteem is a constant battle. The secretarial skills of 20 girls have market value. Last year Federal Agencies in Washington offered them jobs. Not one accepted. "Usually I have more luck," he mused, "but you have to convince the parents to let them go."

Informants at both the Richton and Junction City schools were concerned about many of their students' depressed aspirations and lack of motivation, but for quite different reasons. In Richton, these insufficiencies seemed to be attributable in part to the fact that home and community were oriented toward enjoyment of that measure of affluence that hard-working parents who had struggled through the depression were able--and almost compulsively driven--to give to their children. In Junction City, school personnel were battling the tendency to "give up" which grows out of poverty. The "snapshot" of Plainsville school and the community in which it is situated is quite different.

Plainsville. The nearly 500 students enrolled in the Plainsville school live in a stable community of 6,000 surrounded by prosperous and locally owned ranches. Within the community are a small chemical plant, a feed mill, and a contracting business as well as the usual businesses necessary to serve an area of more than 400 square miles--food, drug, clothing and hardware stores, lawyers' and physicians' offices, restaurants and gas stations, churches and a mortician. A few members of the community are employed at a military base nearby--but the other salaried workers are employed within the community. The nearest urban and industrial center is over 50 miles away.

The people of Plainsville are 89% native-born white Americans, 1% black Americans, and 10% Mexican Americans. Our informants were not aware of any unemployment in the community nor any unemployables. Nor was anyone known to be on welfare. The community is achievement-oriented. Although over 80% of the ranchers are classified by school officials as "upper-middle-class," their wealth is "hidden-wealth." No conspicuous consumption or indulgence of adolescent "material needs" here! Rather, a deep concern for their children's education, their growth toward maturity, and, of course, involvement in and support of the schools. Whatever "the kiddoes need" at school is often supplied by one member of the community or another without waiting for a bond issue and the next election. This is the result of a happy blending of community concern and a dynamic, dedicated school administration.

The Plainsville school is qualified by the state as an area vocational school and offers six technical and vocational programs in addition to the purely academic one. Indeed, 34% of the students are officially enrolled in non-academic programs and 65% of the students take some technical and vocational courses. Yet 68% of the graduating class goes on to higher education, half to junior colleges (with many later going on for baccalaureate degrees) and half to four-year institutions of higher learning.

Discussion. These three descriptions do not exhaust the possible types of--and relationships between--communities, schools, and students. Nor are they in any sense perfect types to which others may be related. They are, however, three distinctively different examples of the relationships between students, community, and school. It is hard to escape the conclusion that the nature and interplay of these elements affect the students' self-images and the way they view their educational experiences in relation to their future lives. Any realistic evaluations of their schools' programs will have to take this broader environment into proper account. There is no more reason to believe in the "perfect school" than in the "beautiful line." Both depend on how they fit the larger scale.

In Richton, for instance, three guidance counselors for 700 students at a school, richly supported--yet in effect ignored--by the community, are trying to help rather pampered youngsters arrive at realistic decisions about the greater world and their personal places in it. If the children's plans--or their parents' for them--seem unworthy of the school, it also seems as though the school is a better one than the parents require--or even deserve. There is little sign of strong parental interest in and support of the school's specific programs, other than a willingness to "spend money" on the general school budget. Hence we may hypothesize weak parental backing for school work as such and a lower efficiency of school programs than these programs would enjoy in some other environments.

At Junction City, a surprisingly well-designed school, yet with only two counselors for 800 students in a dying community, seems to invoke more fantasies than real future plans in the children. "I want to study piano in Ireland because I once read a story about a girl there and it was so romantic." It must be clear to the alert in such a town that the development of useful personal skills (for immediate employment or for further education) represents the only escape from the local paralysis. This motivation together with the departmental focus of the school's design, could well enhance the effectiveness of many of the school's programs. Yet the tensions and general depression of the expiring town clearly inhibit the realistic motivation and the healthy self-confidence of many of its adolescents.

Plainsville school, as a third example, is in a community both able and willing to provide its young people with an environment apparently more conducive to their growth. The school is strongly supported by the townspeople, both financially and, less directly, by the clear examples they offer of the various fruitful and rewarding adult roles to which their children might aspire. The single guidance counselor here may be sufficient, for a student need only keep his eyes open to see his several, alternative futures being lived out before him.

Yet this very richness of the local scene may have its less apparent disadvantages, which are no less real for being rather hidden. Riesman (1956, p. 121) has built a case for what he calls counter-cyclic education. As Riesman says, schools must offer something that the rest of society does not; that is why they are there. Where the school and the community are redundant, intellectual inbreeding and atrophy can set in. Yet the tension between the two dare not become a discord, lest the demand of one environment begin to supersede the other. If an equal respect for the claims of the real and the ideal marks both a sense of tragedy and of comedy, the same can in all likelihood be said for a community's schools.

A small town like Plainsville, in a sparsely settled area whose schools depend so heavily on the zest of local support, can hardly be expected to mount programs against itself in its local educational plant. Nor is there a college in Plainsville to enrich and broaden the students' sense of the many ways life may be led, apart from local mores.

Under these circumstances one could even hypothesize that the "at-homeness" of the students in their school and in their town, and the same "at-homeness" of each of these environments with the other, could make much of the school's program--especially those elements not directly concerned with comprehending local phenomena or preparing students for local jobs--appear irrelevant or even silly to many students and their families. In this preeminently happy place to live we could therefore imagine programs of less than superlative "professional" merit being accepted, even proudly, by an entire community whose self-esteem is as great as it is unchallenged.

Questionnaire and Test Data

The impressions developed as a result of the school visits were found to be generally consistent with the data obtained through periodic administration of questionnaires and tests in the three schools and in the feeder schools from which the students come. On the other hand, there were instances in which the questionnaire and test data contributed insights not fully developed through the school visits. Details of the analyses of questionnaire and test data will be reported later; however, the general nature of the findings may be suggested through some examples.

The responses of eleventh-grade students to the Background and Experience Questionnaire reflected the community and school characteristics that were visible during the visits. For example, consider the responses to question number 125, "From the list below, which course of study are you taking in high school?" (Table 17).

Table 17. Percentages of Students Enrolled in Each Curriculum

	Richton	Junction City	Plainsville
Academic	56%	70%	65%
Business	32%	7%	3%
Vocational	9%	1%	21%
General and other	3%	15%	5%
Undecided	0%	6%	6%

In Richton, an efficient guidance program has channeled all students, many of them into the well-developed business and vocational programs. In contrast, the majority of students in Junction City are enrolled in the academic program with the general program enrolling the largest minority. The presence of the area vocational school in Plainsville is reflected in the 21% reporting enrollment in a vocational program.

Responses to question number 127 inquiring about the students' feelings about typing courses (Table 18), and to question number 130 concerning their interest in English courses, (Table 19), provide additional insight into the complexity of the curricular patterns. Junction City, for example, with most students formally enrolled in an academic program, has the largest percentage of students enrolled in typing, and a majority report that the courses are interesting. In contrast, Richton, with well-developed and sharply differentiated vocational and business curricula, enrolls a smaller percentage of its students in typing, and only a minority of these report that the courses are interesting.

Table 18. Students' Reported Interest in Typing Courses
(The figures in parentheses are percentages of those who did take typing)

	Richton	Junction City	Plainsville
Didn't take typing	44%	11%	38%
Boring	17% (30%)	21% (24%)	7% (12%)
Undecided	14% (25%)	13% (15%)	16% (25%)
Interesting	25% (45%)	53% (61%)	40% (63%)

The responses from Plainsville follow the participation pattern of Richton but the interest pattern of Junction City. Plainsville also occupies the middle position with respect to interest in English, with Richton students reporting high interest and Junction City students reporting low interest.

Table 19. Students' Reported Interest in English Courses

	Richton	Junction City	Plainsville
Didn't take English	2%	3%	2%
Boring	10%	24%	25%
Undecided	25%	34%	20%
Interesting	63%	37%	52%

The greater interest in English in Richton is also reflected in the answers to question number 92, "How often, on the average, have you read literary magazines such as Atlantic Monthly?" (Table 20)

Table 20. Students' Reports of How Often They Read Literary Magazines

	Richton	Junction City	Plainsville
Rarely or never	82%	99%	96%
Occasionally	10%	0%	4%
Regularly	8%	0%	0%

Even in Richton, however, the percentage of students engaging in literary reading is not large.

The more relaxed approach to school observed in Plainsville is supported by responses to question 97, "During grades 9 and 10, how long have you usually worked on school assignments during the evening?" (Table 21).

Table 21. Students' Reports of Time Spent on School Assignments

	Richton	Junction City	Plainsville
Seldom or never	6%	4%	8%
Less than one hour	18%	23%	32%
One hour a day or more	76%	71%	59%

The generally lower socioeconomic level of the Junction City community is reflected in responses to question number 123, "Do you have an encyclopedia at home?" (Table 22).

Table 22. Percentages of Students Reporting Having an Encyclopedia at Home

	Richton	Junction City	Plainsville
Yes	88%	80%	86%
No, but my parents have considered buying one	5%	3%	7%
No	7%	16%	6%

The overall impression gained from a study of the questionnaire responses, however, was that of great similarity among the three schools and communities. Index numbers[3] developed by weighting the percentage of responses to questions related to socioeconomic status and orientation toward education and adding the weighted percentages were very similar for the three schools. (Table 23).

Table 23. Index Numbers for Socioeconomic Status and Orientation toward Education

	Richton	Junction City	Plainsville
Education of parents (Questions number 113 and 114)	553	537	507
Rooms in home (Question number 117)	346	324	330
Bathrooms in house (Question number 118)	229	223	240
Parents favor more education (Questions number 120 and 121)	903	899	903
Parents show interest in school work (Question number 119)	416	415	414

[3]For example, for questions number 113 and 114 options A-G were weighted 1-7 and the index number was obtained by multiplying weights times percentages for both questions and adding the resulting numbers.

There may be striking differences in certain aspects of these three communities, but at least for the pupils who remain in school to grade 11, the cultural patterns are very much alike. The pressures of the urban ghetto or the rural slum are not a part of the experience of these children.

It is not surprising, then, to discover that the schools are more alike than different in performance on achievement tests in the STEP series. Mean scores for the three schools (and for children in grades 5, 7, and 9 of sending schools) are reported in Table 24. The ranges of mean scores and the averages of the mean scores for the three schools and for the schools in the STEP norms sample are reported in Table 25. It is evident that in comparison with the schools in the STEP norms sample, the three schools are quite homogeneous. Furthermore, they are distinctly above average in achievement in social studies and reading, and average in science. These relationships are further illustrated in Figures 21, 22, and 23 based on the data from the longitudinal samples, that is, on responses of students who were tested in grades 5, 7, 9 and 11.

Differences between the data from the longitudinal samples and the total group samples reflect a variety of possible effects, and the information necessary to distribute the various effects are not available. Some loss is attributable to population mobility, families move into and out of the community; some occurs because students were absent from school on the day the tests were administered. Students who were required to repeat a grade were lost from the sample, as were students who dropped out of school. It is possible, however, to look for relationships and to formulate tentative interpretations, particularly in the light of the data obtained from the school visits.

The school visits, for example, suggested that greater stability marked the Plainsville community than either the Richton or the Junction City communities, and the data of Table 24 are compatible with this conclusion. Fifty-six percent of the total fifth-grade group is found in the longitudinal sample for Plainsville. In contrast, only 48% of the total fifth-grade group for Richton and 37% for Junction City remain in the longitudinal samples. In both Richton and Plainsville, however, the number of eleventh graders is only slightly smaller than the number of fifth graders (133 vs. 149 for Richton and 115 vs. 125 for Plainsville). Apparently attrition is being balanced by an increase in the population of the community. In Junction City, on the other hand, there is a sharp decrease (203 vs. 139) in school population between grade 5 and grade 11. Either there is a high dropout rate or else the population of the community has decreased during the period covered by the longitudinal study.

Mean scores for the fifth-grade samples in the three schools, both longitudinal and total group samples, and the differences between the mean scores are reported in Table 26. In the case of Richton, the differences are relatively small, as would be the case

Table 24

Means, Standard Deviations, and Numbers of Students in Longitudinal and Total Group

Samples in Three Schools (STEP Social Studies, Science, and Reading Tests)

Test	Grade	Richton Longitudinal Mean	S.D.	N	Richton Total Group Mean	S.D.	N	Junction City Longitudinal Mean	S.D.	N	Junction City Total Group Mean	S.D.	N	Plainsville Longitudinal Mean	S.D.	N	Plainsville Total Group Mean	S.D.	N
Social Studies	5	255.6	7.7	71	255.1	11.0	149	259.3	13.6	76	253.8	14.2	203	257.4	16.2	70	253.8	14.9	125
	7	268.4	10.1	71	268.1	11.5	139	269.4	11.8	75	265.2	11.7	188	266.7	11.7	69	265.1	11.1	132
	9	274.3	12.3	70	273.7	13.6	138	278.9	13.4	76	273.4	14.2	208	275.3	15.1	70	274.2	14.0	138
	11	278.7	11.6	70	279.8	11.8	132	284.8	13.5	75	283.3	13.5	139	282.7	13.4	70	280.9	13.5	115
	11-5	23.1						25.5						25.3					
Science	5	253.5	10.1	71	252.6	11.2	149	255.1	12.3	76	250.5	11.9	202	252.9	12.5	70	250.0	12.4	125
	7	262.7	12.1	69	263.8	13.9	136	265.3	13.7	75	260.4	13.3	188	261.6	14.7	69	259.4	13.5	132
	9	271.9	13.7	70	271.7	15.0	138	276.8	15.4	76	270.6	15.8	211	273.7	16.3	70	270.9	15.8	138
	11	276.5	13.6	70	277.0	14.1	133	278.5	15.3	75	277.0	14.8	139	276.7	16.1	70	275.0	15.8	115
		23.0						23.4						23.8					
Reading	5	262.7	14.9	71	260.3	15.3	149	260.5	16.5	76	254.4	15.9	203	259.8	17.1	70	255.1	16.3	125
	7	275.3	15.1	71	275.0	16.7	139	274.3	16.8	75	268.0	18.6	188	269.4	20.8	69	266.4	19.7	132
	9	286.2	14.5	70	284.3	16.4	138	286.0	15.9	76	279.9	18.5	212	282.9	15.7	70	280.1	17.3	138
	11	296.4	14.4	70	295.5	15.6	133	295.6	17.1	75	294.2	16.0	139	290.6	21.3	70	289.6	19.9	115
		33.7						35.1						30.8					

Table 25

Ranges of Mean Scores on STEP Social Studies, Science, and Reading Tests for Three Growth Study Schools and for Schools in the STEP Norms Sample

Grade	Sample	No. of Schools	Social Studies			Science			Reading		
			Highest	Lowest	Average	Highest	Lowest	Average	Highest	Lowest	Average
5	Longitudinal	3	259.3	256.6	257.4	255.1	252.9	253.8	262.7	259.8	261.0
	Total Group	3	255.1	253.8	254.2	252.6	250.0	251.0	260.3	254.4	256.6
	STEP Norms	47	255.0	235.0	248.0	262.0	234.0	251.0	265.0	232.0	252.0
7	Longitudinal	3	269.4	266.7	268.1	265.3	261.6	263.2	275.3	269.4	273.0
	Total Group	3	268.1	265.1	266.1	263.8	259.4	261.2	275.0	266.4	269.8
	STEP Norms	47	265.0	240.0	255.0	272.0	242.0	261.0	282.0	240.0	263.0
9	Longitudinal	3	278.9	274.3	276.1	276.8	271.9	274.1	286.2	282.9	285.0
	Total Group	3	274.2	273.4	273.8	271.7	270.6	271.1	284.3	279.9	281.4
	STEP Norms	46	278.0	245.0	266.0	278.0	248.0	270.0	289.0	248.0	275.0
11	Longitudinal	3	284.8	278.7	282.1	278.5	276.5	277.2	296.4	290.6	294.2
	Total Group	3	283.3	279.8	281.3	277.0	275.0	276.3	295.5	289.6	293.1
	STEP Norms	44	285.0	253.0	273.0	287.0	263.0	279.0	302.0	258.0	287.0

Table 26

Mean Scores and Differences Between Mean Scores of Students in Fifth Grade Longitudinal and Total Group Samples in Three Schools

	Social Studies	Science	Reading
Richton			
Longitudinal	255.6	253.5	262.7
Total Group	255.1	252.6	260.3
Difference	.5	.9	2.4
Junction City			
Longitudinal	259.3	255.1	260.5
Total Group	253.8	250.5	254.4
Difference	5.5	4.6	5.9
Plainsville			
Longitudinal	257.4	252.9	259.8
Total Group	253.8	250.0	255.1
Difference	3.6	2.9	4.7

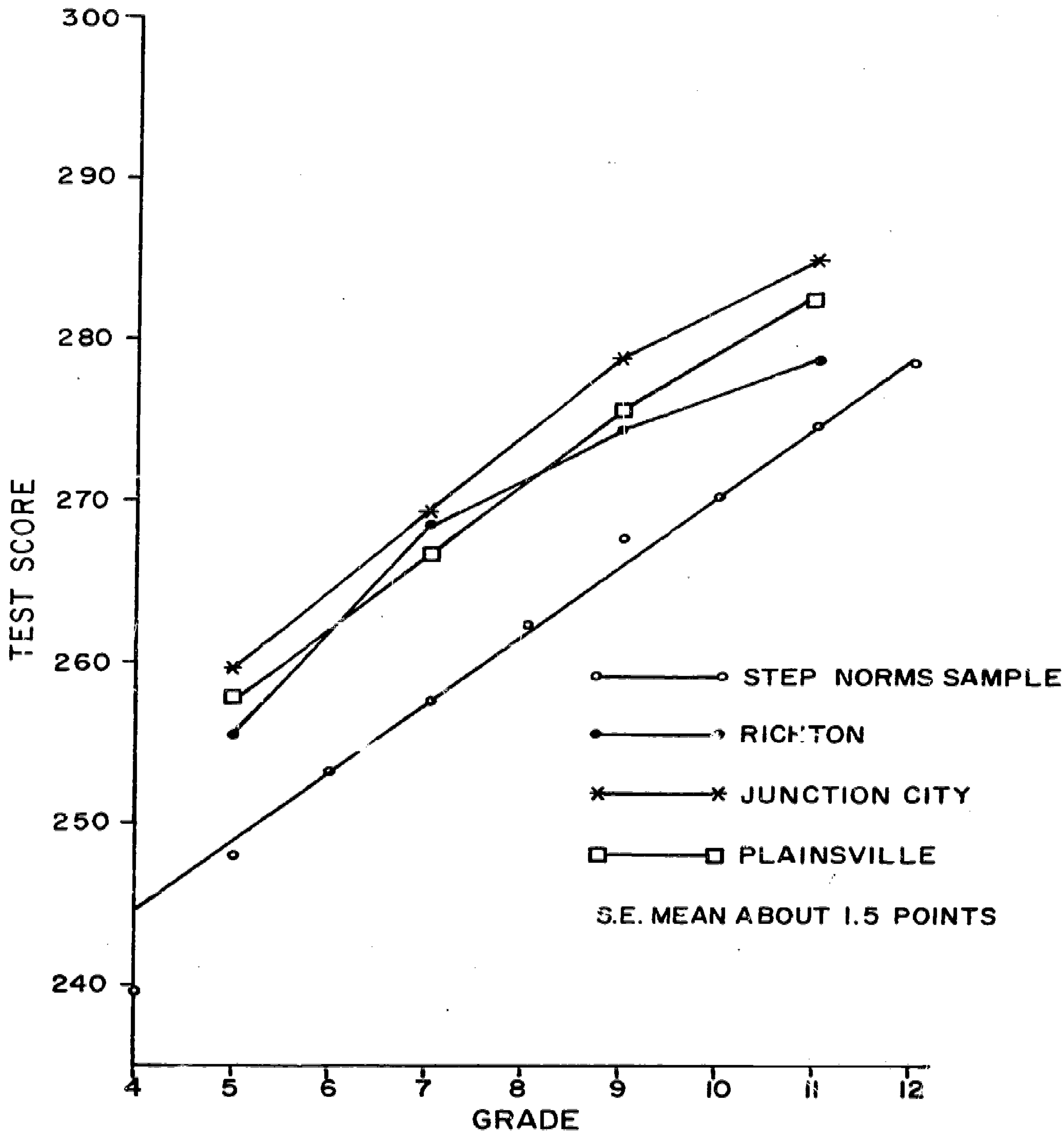

Figure 21. Mean STEP social studies scores for longitudinal samples in three school systems and for the schools in the STEP norms sample.

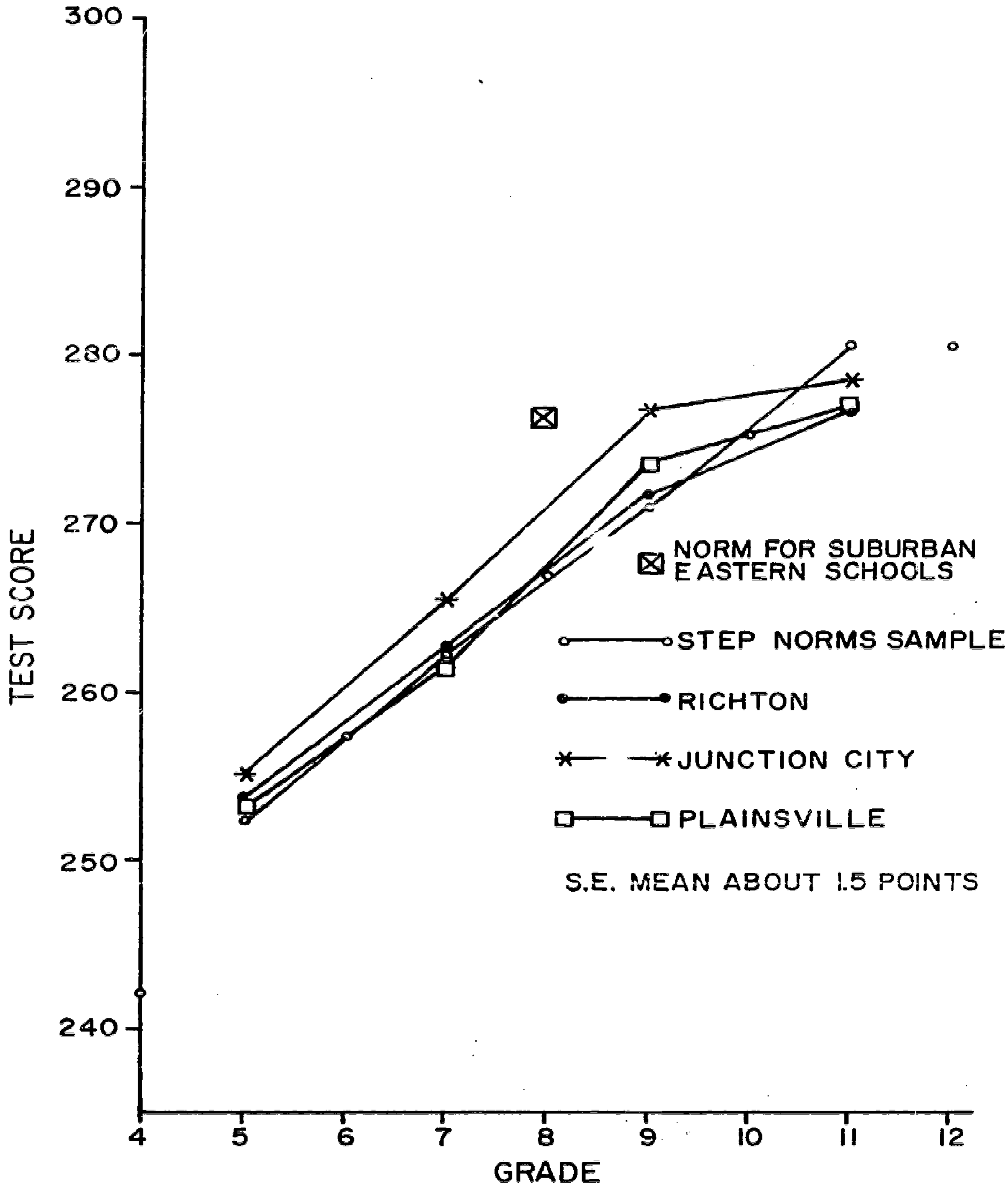

Figure 22. Average STEP science scores for longitudinal samples in three school systems and for the schools in the STEP norms sample.

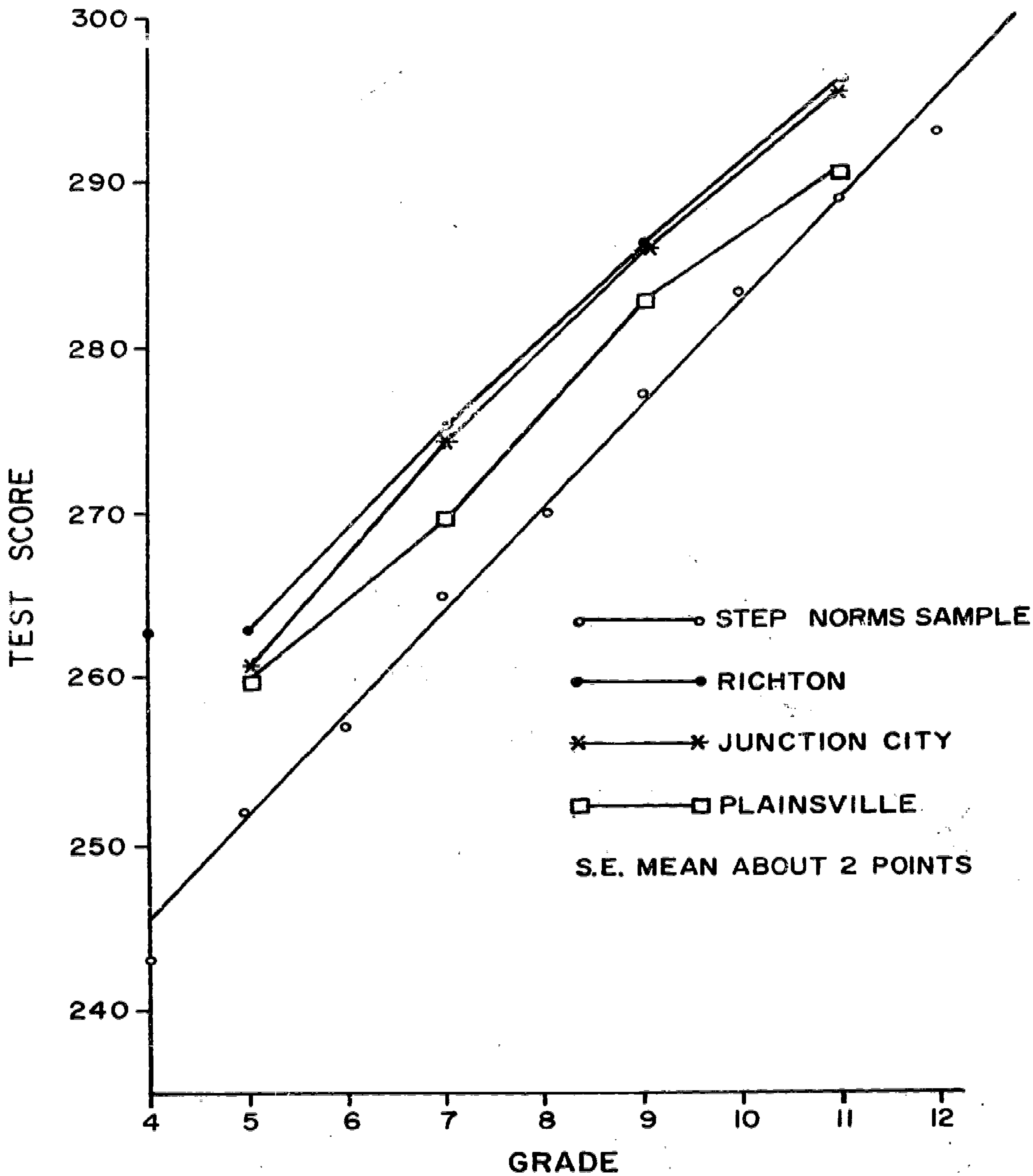

Figure 23. Average STEP reading scores for longitudinal samples in three school systems and for the schools in the STEP norms sample.

if loss of cases in the longitudinal sample were attributable to movement into and out of the community of families of similar background. In the case of Junction City, the differences are relatively large, as would be the case if loss of cases in the longitudinal sample were attributable to lower ability students dropping out of school before grade 11. The differences for the Plainsville samples fall between those for Richton and Junction City, as would be the case if only a few students of very low ability were dropping out of school.

An examination of the test data for the three schools generates more questions than answers. Apparently, Junction City achieves a high level of output by a process of attrition of students of lower ability. The extent to which this attrition is attributable to home influences or to school influences--or to an interaction of home and school influences--cannot be determined from the data now available. Perhaps the attrition is simply a reflection of the lack of opportunity for the youth of the community as they approac' adulthood. One wonders, however, how the picture might change if Junction City were able to provide the type of differentiated program and the guidance available to the students in Richton. Perhaps the school in Junction City is reflecting in its own way the effects of lack of relevance that has led--in urban settings with larger concentrations of students who lack an academic orientation--to strong protests. If one looks only at test data for the group remaining in school through grade 11, the picture is a highly reassuring one. A close inspection of differences between longitudinal and total group data over time is certainly less reassuring.

Summary and Conclusion

Obviously, our evidence is limited. We must spend much more time at individual schools, observing and talking with students, teachers and administrators before we can compare the relative effectiveness of programs in developing either cognitive growth or the attitudes and skills necessary for effective adulthood. It is particularly important in making statistical comparisons between schools to remember that only about half of the students who were tested in the fifth grade appear in the eleventh grade sample. There are a number of reasons why this is so. In spite of the fact that all the communities that were visited were relatively stable, some students do move away or transfer to private schools.

Other students do not move through the system at the normal rate. Their progress is impeded by illness or academic failure. We do know that no school in our sample reports more than a 6% loss during the three or four years covered by that school of students who seek no further education of any kind. And we know that all these schools are trying hard, with increasing success, to lower this "true" dropout rate.

There are several ways of holding students in school, such as switching them to less demanding curricular programs or providing them with tutors. All our informants agreed, however, that co-operative education programs, which give students work experience in the larger society as well as in the school environment, are particularly effective for accomplishing this end. Whether students build a house, raise prize steers, work in hardware stores or bakeries, the experience seems to foster the development of skills and attitudes which as A. D. C. Peterson (1968, p. 8) says, "Enable most men and women to play their appropriate part in society...and at the same time to realize their best selves." Often for the first time in their lives students find the relevance of their academic courses to their lives in the larger society. They are not taking Math I because it's a prerequisite for Math II. They are learning mathematics in order to compute the number of board-feet necessary to complete a floor, or trigonometry and physics to enhance their skills as millwrights. Nor are they moving through four years of English in order to have the proper number of Carnegie units to fulfill college entrance requirements. They are studying English to increase their reading comprehension and their written and verbal communication--in order to deal effectively with business associates and customers. They are learning the fundamentals of research and of writing technical reports in order to increase their competencies in their chosen fields--"The Fundamentals of Hand Care Including Diseases of the Nail," "The Evolvement of an Automatic Transmission," "Safety Factors in Scuba Diving."

Having examined three patterns of relationships between schools and the larger society in small, relatively self-contained communities, we might summarize our tentative conclusions about the relationship of any school's program and its actual impact on the students:

(1) A school in a community where the parents are not truly concerned with education will find its programs, however well-conceived, less effective than they might otherwise be.

(2) A school in a depressed or declining community may count on strong motivation for learning in some cases--as a way of getting up and/or out--but may also suffer unrealistic student concepts of themselves and their later careers.

(3) A school which is too indistinguishable from its local community--its values and aspirations--finds it easier to obtain tax support than to enlarge and complicate its students' visions of the world. It merely mirrors the values of the community. Yet, whatever the possible limitations of the students' sophistication and test scores, their self-confidence may well ground them more firmly and take them further than would academic achievement won in more sophisticated or in more desperate spots.

Chapter 8

Negro-White Differences in Adolescent Educational Growth[1]

Michael Rosenfeld and Thomas L. Hilton

The past 50 years have seen considerable consistency in published research concerning Negro and white differences. The results generally indicate that average scores made by Negro groups on intelligence tests are consistently and significantly lower than those made by white groups in the same communities (e.g., Coleman et al. 1966; Tyler, 1956). Almost all of these investigations, however, have been cross-sectional in nature--an approach involving testing samples of subjects at each grade or age level at one point in time. A nationwide study of this type was conducted by Coleman in 1966. He reports that whites scored higher than Negroes in each region of the United States, and at each grade level investigated. In addition, he found that test score differences between Negro and white students were greater at grade 12 than those initially present at grade 1. These results are fairly typical of cross-sectional findings, and are frequently cited as evidence of differential rates of intellectual growth for Negro and white students.

Whenever growth rates are estimated from cross-sectional data, however, there is always the possibility that differences observed are attributable to uncontrolled sample differences (e.g., more dropouts in one sample than the other, Hilton & Patrick, (1970). The obvious answer is longitudinal data, i.e., data from repeated measurement of the same subjects at different points in time.

Few longitudinal studies of Negro and white patterns of intellectual growth have been reported. One such study by Osborne (1960) compared the arithmetic and reading skills and mental maturity of white and Negro children in a southeastern state. On all measures, the Negro students were below the white students at the sixth grade level and the gap increased from the sixth to the tenth grade. For the Negro group, achievement and mental maturity showed little or no increase from the eighth to the tenth grade. One wonders, however, to what extent the educational treatments were equal; presumably the Negro and white schools were separate. Secondly, it is likely that in grades 9 and 10 a much higher proportion of the white students than Negro students were enrolled in academic (college preparatory) programs as opposed to non-academic (vocational) programs. Assuming that the academic programs provide

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[1]This chapter is a revision of a paper presented in a symposium entitled "Explorations in Vocational Development and Education" at the Seventy-Sixth Annual Meetings of the American Psychological Association. The authors are indebted to Charles E. Hall who conducted the data analysis.

more formal instruction in traditional academic subject matter, students enrolled in such programs should display higher scores o conventional academic achievement tests, regardless of race.

The study reported in this chapter was designed to compare, longitudinally, the academic growth of Negro and white students w attended the same high schools and were enrolled in the same curricula. It also investigates the relationship of a measure of so economic status (SES) to academic growth.

Method

Subjects in this study consisted of 817 students (316 Negro a 501 white) for whom complete Growth Study data were available for each variable in the study for the grades noted. They were select from six high schools in two cities--one Midwestern and one Wester The proportion of Negroes in the six schools ranged from 10% to 9C of the student bodies.

The requirement of complete data necessitated both continued attendance in high school as well as stable residence in the commu nities included in the investigation for a seven-year period. Thu the subjects in this study, particularly the Negro group, represen a selected sample.

To ascertain just how different the study subjects may have b from the total sample of students attending the schools in questio the means in Table 27 were computed. When SCAT and STEP were administered at the grade 11 level, all of the students attending the schools took the tests whether they had participated in the study previously or not. These data provided the "full sample" means and standard deviations. The surprising fact is that the means and standard deviations for the study sample do not differ appreciably from those of the full sample, suggesting that the study sample was more representative of the students attending these schools in the eleventh grade than one would think in view of the large reduction in the sample resulting from the requirements of the longitudinal design.

Table 28 provides a description of the two samples in terms of the SES of the students' parents. SES was computed by summing the level of each parent's education, the occupational level of the family's main provider, and the number of bathrooms in the student' home or apartment. A score of 11, for example, might indicate that each parent graduated from high school, that the father was a technician or perhaps a salesman, and that they had one bathroom in their home. On the average, the study subjects might be described as middle class or lower middle class, roughly speaking.

A multivariate analysis of variance program (MANOVA) devised by Clyde, Cramer, and Sherin (1966) and modified by Hall (1967) was used in the analysis of the data. This program not only provides relevant F ratios but also performs a discriminant function analysis

Table 27

Comparison of Mean Grade 11 SCAT Verbal Scores of Study Sample

and Full Sample

	Academic						Non-academic					
	White			Negro			White			Negro		
Town A												
Boys	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD
Study Sample	97	289.5	13.3	25	281.3	10.9	52	278.0	15.4	43	264.6	13.6
Full Sample	135	290.5	13.0	45	280.2	12.5	87	276.0	15.6	120	263.7	12.9
Girls												
Study Sample	122	292.3	13.9	31	278.9	13.9	56	280.0	15.0	54	263.3	10.3
Full Sample	178	292.2	13.7	63	277.6	12.1	95	280.8	15.8	130	261.3	11.7
Subtotal												
Study Sample	219	291.0	13.7	56	280.0	12.8	108	279.0	15.2	97	264.0	11.9
Full Sample	313	291.4	13.5	108	278.7	12.4	182	278.5	15.9	250	262.4	12.3
Town B												
Boys	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD
Study Sample	49	295.0	11.2	21	278.6	12.8	41	276.2	11.2	53	268.5	11.1
Full Sample	78	292.6	12.0	33	279.3	12.7	81	277.0	11.1	107	268.6	10.4
Girls												
Study Sample	46	291.6	10.5	27	284.1	11.9	38	275.9	10.3	62	269.0	11.6
Full Sample	73	291.6	11.0	38	280.2	12.5	76	275.5	10.3	112	266.7	11.4
Subtotal												
Study Sample	95	293.4	11.0	48	281.8	12.6	79	276.1	10.8	115	268.7	11.4
Full Sample	151	292.1	11.6	71	279.7	12.6	157	276.2	10.8	219	267.6	11.0
Town A and B combined												
Study Sample	314	291.8	13.0	104	280.8	12.7	187	277.8	13.6	212	266.0	11.9
Full Sample	464	291.7	12.9	179	279.0	12.5	339	277.4	13.8	469	264.9	12.0

Table 28

Mean Socioeconomic Status of Negro and White Students Grouped by

Town, Curriculum, Sex, and High School Attended

Town A

	Academic						Non-academic					
	White			Negro			White			Negro		
Boys	N	$\overline{X}$	S.D.	N	$\overline{X}$	S.D.	N	$\overline{X}$	S.D.	N	$\overline{X}$	S.D.
School												
1	5	8.4	2.6	16	9.6	2.9	9	9.9	3.0	27	8.3	3.4
2	17	11.9	3.3	7	12.2	5.1	9	12.0	4.0	15	10.3	4.1
3	75	14.2	3.6	2	11.5	3.5	34	13.0	3.7	1	9.0	
Girls												
School												
1	5	8.8	1.5	19	9.2	2.4	3	7.3	0.6	44	8.1	3.3
2	19	13.0	3.1	6	8.3	3.7	22	11.4	3.8	7	7.0	3.0
3	98	13.6	4.1	6	8.7	3.1	31	12.5	3.9	3	7.3	2.5
Subtotal	219	13.4	3.7	56	9.6	3.1	108	12.0	3.6	97	8.6	3.4

Town B

	N	$\overline{X}$	S.D.	N	$\overline{X}$	S.D.	N	$\overline{X}$	S.D.	N	$\overline{X}$	S.D.
Boys												
School												
1	46	12.5	3.2	15	9.5	3.0	14	10.8	2.9	18	10.0	3.3
2	3	7.0	1.7	6	7.7	2.9	4	6.3	3.4	24	9.1	2.8
3	---	---	---	---	---	---	23	8.0	3.0	11	7.2	3.3
Girls												
School												
1	45	11.9	4.4	15	9.7	4.0	26	9.0	4.0	18	9.6	3.2
2	1	10.0	---	12	7.8	2.7	5	6.6	2.6	44	7.8	2.8
3	---	---	---	---	---	---	7	7.4	2.3	---	---	---
Subtotal	95	12.0	3.7	48	8.9	3.2	79	8.6	3.2	115	8.6	3.0
Total	314	13.0	3.7	104	9.2	3.2	187	10.6	3.5	212	8.5	3.2

Note: The means and standard deviations for the subsample and the total are weighted averages of the means and S.D.'s of each school sample.

of the variables in such a way as to show what combination of all the variables best discriminates among the groups.[2] At each grade, the MANOVA program treated the following factors as design parameters:

Sex	(2)	(Male and female)
Curriculum	(2)	(Academic and non-academic)
Cities	(2)	(One Midwestern and one Western)
Schools	(6)	(Three from each city)
Race	(2)	(Negro and white)[3]

The relationship of these factors to the following variables was then examined:

SCAT	(2 scores)	(Verbal and Quantitative)
STEP	(6 scores)	(Reading, Writing, Listening, Social Studies, Math, and Science)
SES	(1 score)	(Scale derived from BEQ)

From Table 28 it can be seen that the Negro sample had consistently lower SES scores than the white students. This suggested the possibility of making covariance adjustments in the test scores in terms of differences in SES. This adjustment, however, requires the assumption of equality of within-group regression, an assumption not supported by the data. Why the regressions differ significantly is an interesting question in itself. Is the underlying relationship between the two variables different for the two groups? In any case it required the authors to treat SES as a variable in the same manner as the test scores were treated.

In view of the nonrandom selection of the samples and uncertainty about meeting all the assumptions underlying the analysis, the study must be regarded as exploratory and descriptive in nature. The authors view the MANOVA as providing a rough check of the statistical significance of the differences observed.

Results

The results are presented in detail in Tables 29, 30, and 31 and Figures 24, 25, and 26. Only statistically significant effects

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[2]This program was also used by Patton (Chapter 6). His report includes a somewhat more detailed description of the method.

[3]Actually, it would be more precise to use some term such as "non-Negro" as a label for the balance of the sample since about 10% of the balance were students of Mexican or Oriental parentage. Nevertheless, the usual practice of referring to the "non-Negro" students as "white" will be followed.

Table 29

Significant Multivariate F Ratios at Grades 5, 7, 9, and 11

Source	Grade 5			Grade 7[a]			Grade 9[a]			Grade 11[a]		
	F	df	p less than	F	df	p less than	F	df	p less than	F	df	p less than
Town x Curriculum x Race (TCR)	N.S.	--	--	2.22	(9/758)	.019	1.87	(9/750)	.054	N.S.	--	--
Race	15.04	(9/766)	.001	2.99	(9/758)	.002	3.01	(9/750)	.002	4.17	(9/742)	.001
Curriculum	18.62	(9/766)	.001	5.82	(9/758)	.001	6.22	(9/750)	.001	5.15	(9/742)	.001
Sex	17.94	(9/766)	.001	12.09	(9/758)	.001	10.04	(9/750)	.001	7.37	(9/742)	.001
Schools within Town A	9.49 2.89	(18/1532) (8/766)	.001 .004	5.33	(18/1516)	.001	4.48	(18/1500)	.001	8.51 3.54	(18/1484) (8/742)	.001 .001
Schools within Town B	15.18 2.43	(18/1532) (8/766)	.001 .013	8.18	(18/1516)	.001	8.23	(18/1500)	.001	6.62 2.23	(18/1484) (8/742)	.007 .024
Town	14.91	(9/766)	.001	24.02	(9/758)	.001	36.45	(9/750)	.001	9.43	(9/742)	.001

[a]Grade 5 STEP and SCAT included as covariates in grade 7 MANOVA; both grades 5 and 7 SCAT and STEP included as covariates in grade 9 MANOVA; grades 5, 7, and 9 SCAT and STEP scores included as covariates at grade 11.

Table 30

Univariate F Tests of Mean Differences between Scores of Negro and White Students after Covariance Adjustments

(Figures in Table Are P Values)

	Grade			
	5	7	9	11
STEP				
Math	.001	.001	.007	.001
Science	.001	.866	.492	.013
Social Studies	.001	.466	.510	.432
Reading	.001	.156	.185	.667
Listening	.001	.178	.693	.231
Writing	.001	.952	.009	.653
SCAT				
Verbal	.001	.008	.001	.011
Quantitative	.001	.014	.039	.031
SES	.001	.005	.008	.008

Table 31

Titles for Discriminant Functions Associated with

Significant Effects at Grades 5, 7, 9, and 11

Source	Grade 5	Grade 7	Grade 9	Grade 11
Town x Curriculum x Race (TCR)		1. Listening and SES	1. Reading and SES	
Race	1. General achievement and ability plus SES	1. Math, Verbal, Quantitative plus SES	1. Math, Writing, Verbal plus SES	1. Math, Science, Verbal, Quantitative plus SES
Curriculum	1. General achievement and ability plus SES	1. General achievement and ability	1. Verbal, Quantitative, and Reading	1. Social Studies, Reading, Writing, Verbal, and Quantitative
Sex	1. Reading, Writing, and Verbal	1. Writing, Quantitative, and Science	1. Listening	1. Science, Writing, and Quantitative
Schools within Town A	1. General achievement and ability 2. Science, Math, Social Studies, and Reading	1. Math, Listening, Verbal plus SES	1. Verbal and SES	1. Listening and SES 2. Reading
Schools within Town B	1. General achievement and ability 2. Math, Social Studies, and Verbal	1. Listening and SES	1. Math, Writing, Verbal plus SES	1. SES 2. Listening, Writing, Quantitative
Town	1. Quantitative plus SES	1. Listening plus SES	1. Science, Listening, and Quantitative	1. Quantitative plus SES

Figure 24

Mean Scores of Negro and White Students on STEP Writing, Science, Reading and Listening

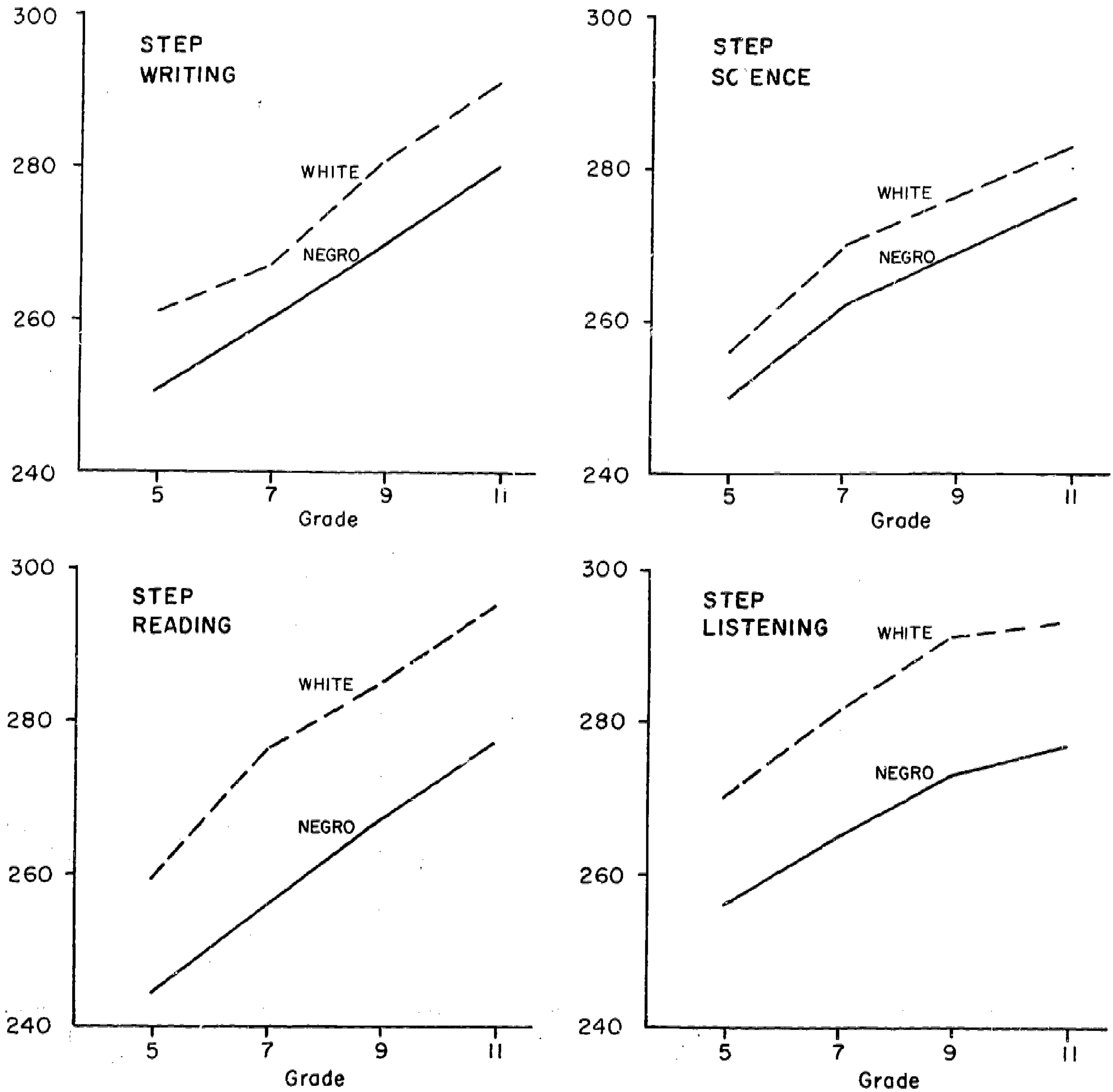


Figure 25

Mean Scores of Negro and White Students on SCAT Verbal and Quantitative and STEP Social Studies and Math

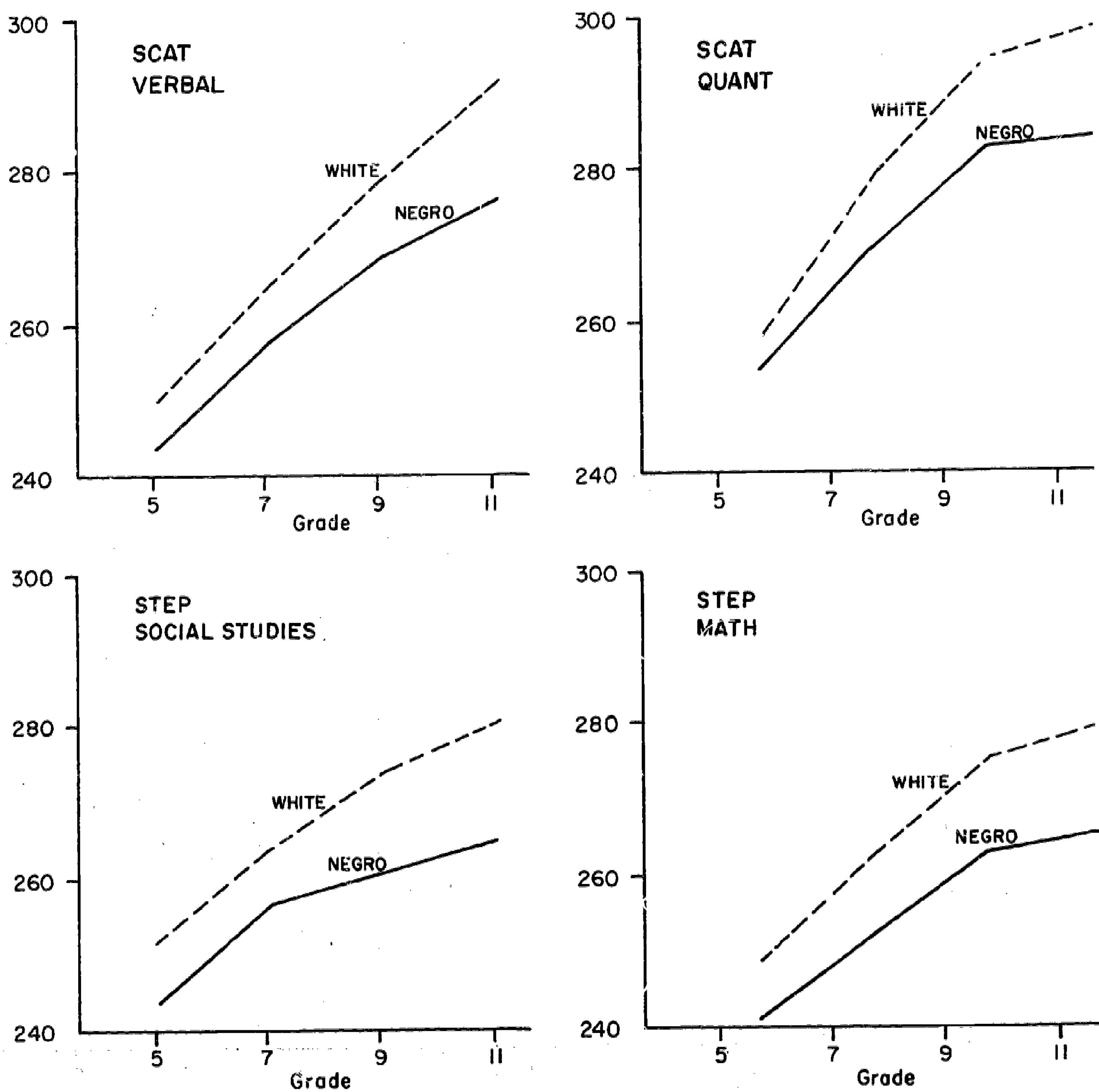
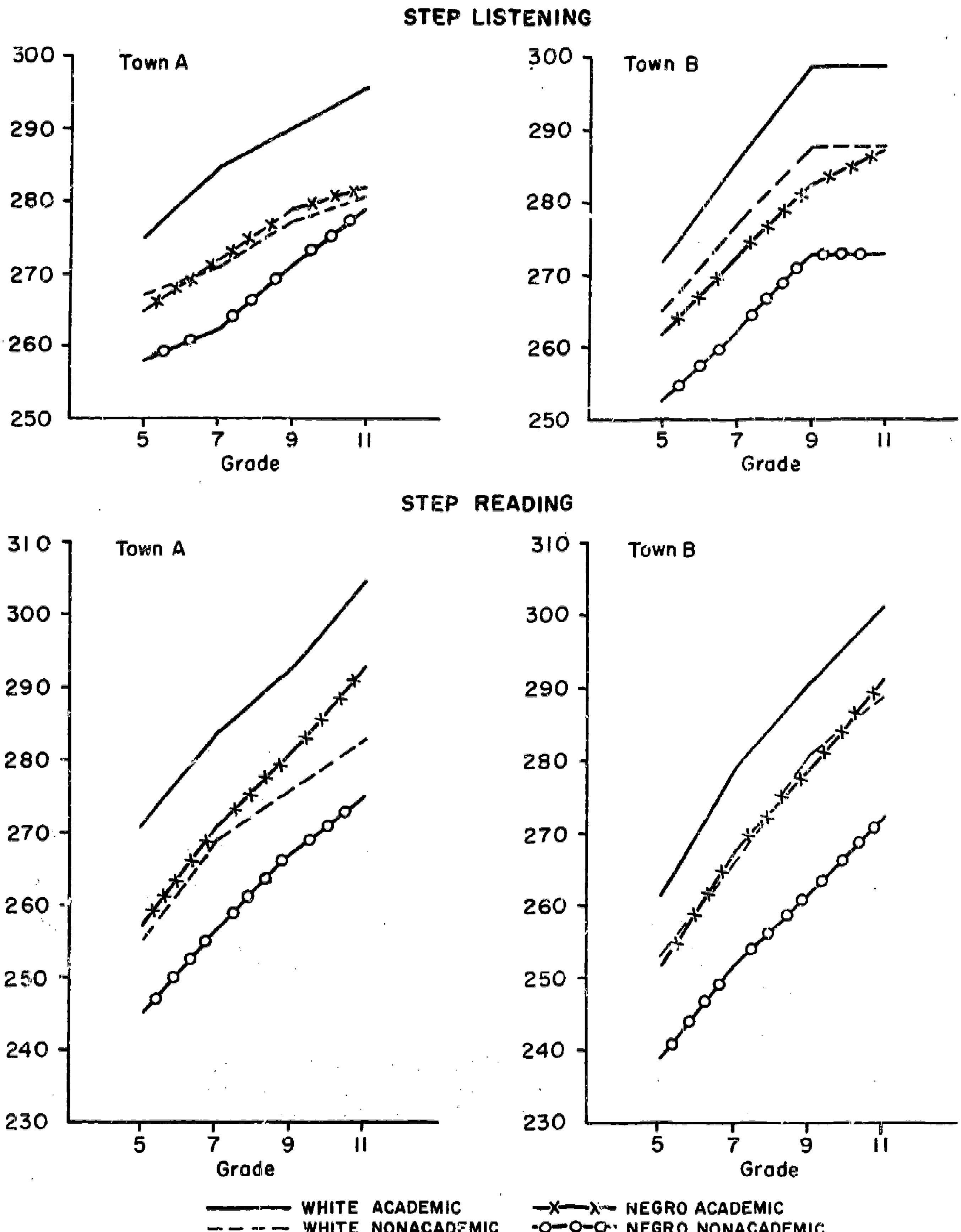


Figure 26

Comparison of Mean Scores on Two STEP Tests of Students in Each Town



are reported. None of the two-way interactions was significant, for example, and they therefore have been omitted. The absence of certain significant differences is of interest, however, and will be discussed later. Only the significant effects will be summarized in the following paragraphs.

Race. The main effect of race was significant, not only at the grade 5 level but also at grades 7, 9, and 11, even after covariance adjustments were made at each grade level for differences existing at the previous grade levels. At grade 5, a general achievement discriminant function emerged, indicating that maximum discrimination between the races was achieved by an approximately equal weighting of all the SCAT and STEP test scores and, in addition, SES. The univariate F ratios indicated that the differences between all mean scores were significant.

Figures 24 and 25 show the trend lines for each of the SCAT and STEP subtests. The trend lines indicate that the mean differences between Negro and white students increase with passing time on almost all of the tests. When covariance adjustments are made in the means, however, it appears that on several of the tests the divergence in each time interval is no more than what we would expect on the basis of the differences which existed at the beginning of the time interval. In other words, there is a tendency for individual scores to fan out in time, regardless of skin color. The high achieving students gain at a higher rate than the low achieving students. For example, Figure 24 shows that the mean differences in STEP Social Studies diverge from the seventh to the eleventh grade. That they do is a fact which is educationally significant. When, however, covariance adjustments are made in the means, the adjusted means are not significantly different, indicating that the observed differences at the seventh grade level are probably attributable to differences existing at the fifth grade level, that differences at the ninth grade level are attributable to differences at the fifth and seventh grade level, and so on.

Not all differences could be attributed to previous status, however. Both the univariate and multivariate analyses indicate that the adjusted SCAT Verbal and Quantitative and STEP Math score means differ significantly over time, as do STEP Science at the eleventh grade level and STEP Writing at the ninth grade level.

Estimating from the trend lines, the fifth grade Negro students, pooled across all schools, sex, and curricula, were roughly one year behind the white students in STEP Math and SCAT Verbal and Quantitative, and the gap widened significantly on these three tests as the two groups advanced in grade. By grade 11, the Negro students were two to four years behind, depending on which of these three tests were cited.[4]

[4] In making comparisons across STEP subtests one must keep in mind that the scales are not horizontally equated, i.e., a scaled score on one scale is not necessarily equivalent to the same scaled score on another.

Other main effects. Curriculum, sex, town, and schools within each town consistently yielded significant effects when no adjustments were made, as well as when covariance adjustments were made. Focusing on those differences which have a bearing on the observed Negro-white differences, we see that in both cities the schools that were lowest in achievement were those with the highest proportion of Negroes. In addition, three times as many white students were enrolled in the academic program as in the non-academic programs, and twice as many Negroes were enrolled in the non-academic programs as the academic programs. Thus, in interpreting the large differences in ability and achievement between the races, one must keep in mind that, to some unknown extent, the differences were confounded with curriculum and school differences.

Town, curriculum, race interaction. The Town x Curriculum x Race (TCR) interaction was significant at the grade 7 and 9 levels when covariance adjustments were made for differences at the previous grade levels. When no covariance adjustments were made, only the grade 7 results approached significance. Examination of the discriminant functions indicated that SES differences provided most of the discrimination between the two races. STEP Listening and STEP Reading did provide some of the discrimination, however. Figure 26 depicts the trend lines for these scores. Note particularly: (1) the increased rate of growth for academic Negroes relative to non-academic whites in Town A, but not in Town B, on STEP Listening between grades 5-7, and (2) the increased rate of growth for academic Negroes relative to non-academic whites in Town B, but not in Town A, on STEP Reading between grades 7-9. Generally, the Negro students in the academic programs have test scores similar to the white students in the non-academic programs. And generally, the Negro students in the academic programs have SES scores similar to the white students in the non-academic programs (see Table 28). Overall, the white non-academics are more like the Negro academics in SES than they are like the white academics.

Discussion

1. The test scores of white students were significantly higher than the scores of Negro students at grade 5 on all tests of SCAT, STEP, and a measure of SES. This finding is in agreement with the results of most cross-sectional studies. Whether the relatively low scores of the Negro students can be attributed to their relatively low SES is an important but unanswered question. A check on the within-group homogeneity of regression indicated that the regression slopes did differ significantly among the groups categorized by race, sex, school, and curriculum, and thus, conventional covariance adjustment for SES differences was not appropriate.

Moreover, one can question the logic of the adjustment, even if regressions are homogeneous. What basis is there for asking how Negroes would perform if only they were of higher SES when, in fact, they are not. As Lord (1968) has pointed out, the answer to the "if only" question depends on the method used to equate the mean scores of the input variable which is supposed to be related causally to the output variable. Surely the causal network is more complex than that implied by simple adjustments based on the linear correlation between SES and test performance.

Also, one can question the appropriateness of the SES measure for the two ethnic groups. Does this one measure, based primarily on occupational and educational differences, mean the same thing for both Negro and white students? In conclusion, then, the authors view the above result as a descriptive finding. It describes what is. It does not, however, explain the why of what is.

2. Beyond the fifth grade, the initial gap between the mean scores of Negro and white students widened on some tests in the battery and remained essentially the same on others. There was no test in the battery on which Negroes performed better than whites. Again, however, there are a number of possible explanations for this finding. There were, for example, significant differences in mean achievement among the schools within each of the two cities of the sample. At the high school level, the Negro and white students attended the same schools but this was not necessarily true during their elementary and junior high school years. Although some of the elementary schools were fully integrated, most were populated by predominantly one group or the other. Even at the high school level the proportions of Negro and white students attending each of the six schools differed. If the quality of instruction differed, this fact alone could account for the observed difference in academic growth between the groups.

A second alternative explanation concerns curriculum differences in academic growth. There were substantial differences between the academic and non-academic students in mean SCAT and STEP scores and, again, the proportion of Negroes and whites enrolled in the two major curriculum groups differed. The majority of the whites were in the academic program and the majority of Negroes in the non-academic program. Between grades 9-11 Negroes and whites grew at substantially the same rates (when previous differences in test scores were equated) on Reading, Writing, Social Studies, and Listening. It seems possible that these content areas might be part of the core curriculum to which both academic and non-academic students are exposed. Whites grew at a faster rate on STEP Math and Science as well as on SCAT Verbal and Quantitative. The content areas which these tests assess may be ones to which academic and non-academic students are differentially exposed, thus accounting for the differences observed. In addition, curriculum membership in itself is a complex interaction of self-selection, counselor judgment, and school policy. The observed differences are, therefore, as confounded as school differences, and the researcher is left with results to be explained rather than tested hypotheses.

The data indicate that even though whites grow at a faster rate than Negroes on many tests in the battery, both Negro and white subjects continued to gain and grow on all tests of SCAT and STEP. There was no test on which Negroes or whites showed a decline from one testing period to the next. This finding was true regardless of the curriculum in which they were enrolled.

It has already been noted that: (a) the schools most heavily populated by Negroes were the poorest performing schools on SCAT and STEP tests--indicating that inappropriate teaching might be as plausible a cause as poor learners; (b) the Negro sample is a lower SES group than the white sample. Considering these points, it should not be surprising to discover that white students grow at a faster rate on many tests than do Negro students. It is worth noting, however, that in spite of the possible disadvantage mentioned above, Negro students do show gains regardless of their curriculum.

Other results are also subject to cautious interpretation, and suggest further research. Of particular interest are the interactions, especially those which were <u>not</u> significant. There was no interaction between curriculum and race, for example. In other words, <u>overall</u> the academic growth of the Negro students relative to the white students did not depend on which curriculum they were enrolled in. There was, however, a significant three-way interaction between town, curriculum, and race. In view of the questions raised above, no effort will be made to interpret this interaction. The possibilities suggested by the interaction should, however, be investigated in future research. Why do the Negro academic students show relatively accelerated growth rates in one city but not the other?

In conclusion this research has four general points to report:

(1) At the fifth grade level there is a substantial gap between the achievement of white and Negro students.

(2) The fifth grade gap was greatest in STEP Reading and STEP Listening (measured ability to understand spoken language).

(3) On some tests the gap continues to widen thereafter.

(4) On other tests the Negro students exhibit growth which parallels that of the white students, even though they started out, at the fifth grade level, one or two years behind the white students. (What if they had started out equal?)

In the future, it is suggested that greater effort be made in collecting data about the schools and their programs in order to gain a better understanding of circumstances and conditions that help produce the observed results.

Summary and Conclusion

In contrast to past studies of Negro-white differences, most of which have been cross-sectional in design, this study compared longitudinally the academic growth of Negro and white students who attended the same high schools and were enrolled in the same curricula. As participants in the Growth Study, the students had taken a battery of ability and achievement tests in grades 5, 7, 9, and 11. At grade 5 the Negro students were one to two years behind the white students, and on most tests--but not all--the gap increased over time. Analyses of covariance indicated, however, that usually the gap was no more than would be predicted on the basis of the initial differences in mean scores between the groups. The groups also differed appreciably in socioeconomic status.

Chapter 9

Antecedents and Patterns of Academic Growth of School Dropouts[1]

Franklin R. Evans and Cathleen Patrick

The last 10 years have seen a sharp rise of interest in the problem of the high school dropout. Much of the recent research on dropouts, e.g., Schreiber (1967) and Stice and Ekstrom (1964), has attempted to describe dropouts as they were in the ninth or tenth grades, or at the time they left school. Several significant patterns have emerged from these studies. Dropouts are usually older than their grade peers by more than a year, are one to two years below their grade peers in reading level, do not participate in extracurricular activities, have poor school attendance records, and live in lower socioeconomic environments than those who graduate.

Research has been concentrated on describing dropouts at the time of school leaving rather than attempting to identify at an early age those who are likely to later drop out of school. Little has been said about the elementary school characteristics or the patterns of early academic growth of school dropouts, with a few notable exceptions. Bowman and Matthews (1960), for example, in an eight-year longitudinal study, used school records and interview data to investigate, among other things, the attendance patterns and the grade retention records of dropouts. They found that dropouts were older when they entered school and had been retained four times as frequently as graduates. Carrino (1966) also used existing school records to look at attributes associated with dropping out of school. Among the variables he investigated were reading achievement, spelling achievement, and word discrimination in the second grade; attendance record in grades 1-3; and grade retention. He found that number of absences in grades 1-3 and later withdrawal were positively correlated; dropouts had been absent three times as often as those who were graduated (35.2 days to 11.7 days). He also found that a second-grade word discrimination test differentiated between dropouts and nondropouts. Both of these studies showed that measurable differences exist between these two groups even in the early elementary school years.

The present study was aimed at investigating some of the fifth-grade achievement and aptitude variables which discriminated between dropouts and nondropouts. Specifically, the variables under consideration were verbal (V) and quantitative (Q) scores on the School

[1]This chapter is a revision of a paper presented by the senior author in a symposium entitled "Explorations in Vocational Development and Education" at the 76th Annual Meeting of the American Psychological Association, San Francisco, California, August 30, 1968.

and College Ability Test (SCAT), six achievement test scores from the Sequential Test of Educational Progress (STEP), S's age at the beginning of the fifth grade, and a measure of academic growth obtained by subtracting each S's fifth-grade score from his seventh-grade score on corresponding STEP tests. It was hypothesized that the addition of this seventh-grade growth information would add to the prediction of a dropout criterion. If this hypothesis were true, it would indicate that the dropouts' academic growth rate was different from that of the nondropouts.

Sample

The base sample for the present study consisted of all the 1961 fifth-grade students (N = 1459) from a Northeastern urban school system who were tested as part of the Growth Study. Approximately 800 students who had not been retested in 1967 as eleventh graders were identified from the original sample of all fifth grade Ss tested in 1961. The school records of these students were then consulted to find those students who had withdrawn from school for reasons other than transfer to another school, illness, or death. This procedure eliminated all but 88 persons who were then said to be true dropouts. It was additionally required that the dropouts have data from the 1963 seventh-grade testing in order to be included in the sample. This restriction reduced the size of the dropout sample to 68. For purposes of comparison, a sample of 81 students who had been retested in 1967 as eleventh graders were selected to match the dropout sample on sex, race, and the elementary school attended in the fifth grade. These subjects were randomly selected within the school by race and sex cells. For example, if it was found that in elementary school A there were X Negro male dropouts, then X Negro male nondropouts were also selected from school A. (In some cases all subjects in a cell had to be selected, and in some cases there were not enough subjects to match the particular cell of the corresponding dropout sample.) Since the 23 elementary schools involved were known to be neighborhood schools, this matching procedure should have minimized an differences due solely to socioeconomic status.

The dropouts in the sample were representative of those students in the school system who progressed normally (without retention) from the fifth to seventh grades, and who withdrew from school before their class finished the eleventh grade. The nondropouts were representative of classmates of the same race, sex, and elementary school attended who progressed without apparent failure from fifth to eleventh grades.

Results and Discussion

The variables under investigation, their means, standard deviations, correlations with the dropout criterion, and t-tests between dropout and nondropout group means are listed in Table 32. The mean differences between dropouts and nondropouts are significant ($p < .01$) for all of the fifth-grade variables. Age in fifth grade is the single best predictor of dropping out of school ($r = -.53$), and age in combination with any one of the fifth-grade tests yields multiple R's from .54 to .56. Thus, with just two pieces of readily available fifth-grade data, from 29% to 31% of the criterion variance can be accounted for. The test information, however, adds little to a prediction based only on age at grade five.

Dropouts are nearly a year older in fifth grade than their nondropout peers. The dropouts may have failed one or more grades or may have started school later than their peers. The dropouts may have had less ability or may have been less motivated to do well in school than nondropouts. Another possible explanation is that grade-retention acted to cause dropping out, rather than simply predicting that a student would eventually drop out of school. The important finding is that the age discrepancy is apparent as early as the fifth grade.

In order to test the hypothesis that fifth- to seventh-grade <u>growth</u> adds to the prediction of who will drop out of school, the subject's fifth-grade score was subtracted from his seventh-grade score for each of the six STEP achievement tests, and this difference was used as an independent variable in two additional analyses. First, the multiple partial correlation of the set of six difference scores with the dropout criterion was computed, with SCAT-V and SCAT-Q partialed out of both the predictors and the criterion. The multiple partial R in this case was .24, which was not significantly different from zero. The same analysis was repeated, adding age in fifth grade to the variables partialed out. The resulting R of .28 was also not significantly different from zero. From these analyses it was concluded that growth in achievement from fifth to seventh grade did not add any significant information over that which was already available in the fifth grade. It is interesting to note that when both age and SCAT were partialed out, the correlation increased over that obtained when only SCAT was partialed out. This was probably due to age having a higher correlation with the dropout criterion than with the set of difference scores, which suggests that age acted as an indicator of a dropout's total deprivation, rather than just as an indicator of his poor school achievement. One must also keep in mind that even though these values of .24 and .28 seem relatively high, they are partial correlations. Since we have already accounted for a significant portion of the variance by age and fifth-grade SCAT scores, the <u>relative</u> increase in criterion variance predicted is very small.

A look at the bottom portion of Table 32 supports the notion that there are no differences in the rates of academic growth of dropouts and nondropouts. The correlations of the raw difference scores with the criterion range from $-.16$ to $+.17$. Also evident is the lack of significant mean differences in these scores. These results provide no evidence to support the hypothesis of differential growth rates for these two samples.

Table 32

Means, Standard Deviations, Correlations and t-tests

Variable Fifth Grade	Dropout N	Dropout $\bar{X}_1$	Dropout S.D.	Nondropout N	Nondropout $\bar{X}_2$	Nondropout S.D.	r^a	R^b	$t_{\bar{x}_1-\bar{x}_2}$
Age	59	11.55	.76	81	10.62	.74	-.53	-----	-7.29**
SCAT-V	67	242.45	8.03	78	248.33	10.63	.29	.54	3.52**
SCAT-Q	67	251.35	7.13	78	256.31	8.25	.30	.54	3.81**
STEP Math	68	239.46	8.44	81	245.11	10.20	.30	.54	3.62**
STEP Science	68	243.82	9.95	81	252.96	13.00	.36	.55	4.71**
STEP Social Studies	68	241.76	8.37	81	250.72	11.46	.40	.56	5.33**
STEP Reading	68	246.40	11.68	80	255.71	15.25	.32	.54	4.08**
STEP Listening	68	260.29	10.54	81	265.56	11.35	.23	.54	2.90*
STEP Writing	68	244.90	13.06	81	255.09	12.82	.37	.55	4.76**
Difference Scores Seventh-Minus Fifth									
STEP Math	65	10.05	13.10	78	10.49	9.82	.01		.23
STEP Science	63	14.06	10.60	79	10.54	9.21	-.16		-2.10
STEP Social Studies	66	11.97	10.58	78	9.45	8.18	-.13		-1.60
STEP Reading	64	11.11	11.90	76	12.38	10.62	.03		.66
STEP Listening	59	7.90	10.99	78	10.77	7.79	.17		1.77
STEP Writing	59	10.39	12.36	76	7.76	9.94	-.09		-1.36

[a]The correlation with the dropout criterion (D.O. = 1, NDO = 2).

[b]The multiple R with the dropout criterion when combined with age.

**$p < .001$.

*$p < .01$.

From these results it can be seen that with data that are readily available at the beginning of the fifth grade, persons who are potential dropouts can be identified, and that waiting two years for additional information will not increase the probability of a more nearly accurate identification. These and other data show that the differences exist early, perhaps even before fifth grade. It seems reasonable, therefore, that programs which are designed to eliminate the differences which cause students to drop out of school should also begin early. Further research efforts should be aimed at identifying potential dropouts at an early age, and devising methods of early intervention that will help to reduce that potential.

Summary and Conclusion

In an attempt to better understand the phenomenon of early school leaving ("dropping out"), relationships among several areas of academic achievement (STEP) and ability (SCAT) and early school leaving were investigated. The study focused on early identification of school dropouts using ability and achievement measures and growth from fifth to seventh grade as measured by difference scores on several achievement tests.

The dropouts were found to be about a year older than their classmates in the fifth grade, and to score significantly lower on several ability and achievement measures in the fifth grade. No evidence was found to support the hypothesis that data relating to a student's academic growth from fifth to seventh grade would significantly increase the ability to predict future dropouts, or that patterns of academic growth were different for dropouts and non-dropouts.

Chapter 10

Cultural Characteristics as a Moderating Influence on Expected Achievement Within a Curriculum Choice

Donald A. Rock and Franklin R. Evans

With the increased emphasis on efficiency in education today, it becomes of great practical concern to know what determines how much a student profits from his curriculum choice. It is of considerable importance to be able to define and describe those measurable characteristics of an individual's background which may interact with his achievement in his selected curriculum. Such information is, of course, necessary for effective and knowledgeable guidance and placement decisions.

The placement problem is in general concerned with exposing individuals to those "treatments" from which they will most profit, subject to certain constraints within the system such as availability of treatments, etc. This is the traditional classification problem. In its purest sense the problem is unsolvable--in general an individual will appear in only one treatment group, so criterion information is not available for him on all treatments. Thus, we must develop methodology which enables us to make educated guesses about whether or not a person would have done better if he were indeed in a different treatment classification. The study reported in this chapter will propose and empirically test techniques for arriving at compromise solutions to typical classification problems.

The major objectives of this study were to arrive at tentative answers to the following questions:

(1) If the input with respect to past achievement as measured by a battery of standardized tests is held constant (within a curriculum choice), will it be possible to identify subgroups (i.e., groups of individuals having homogeneous profiles on background information) which show significantly greater or lesser achievement on the average?

(2) Are the same background patterns always associated with overachievement, and conversely underachievement, independent of curriculum choice? That is, are the cultural patterns with respect to both level and shape associated with individual under- or overachievement invariant across curricula?

(3) If (2) above is not true, or is only partially true, and the attributes for success and/or failure are not consistent across curricula, then it is hoped that the background profiles of those individuals who do considerably less well than one would expect from their aptitudes may, however, have similar profiles to a success group in another curricula. For example, success may be

"achieved" via many avenues while one's channels to failure may be more or less limited, or vice versa. It should be made clear here that our terms "success" and "failure" within a curriculum are only relative, and simply reflect whether or not a group's performance with respect to school grades is better (or worse) on the average than would be predicted from their inputs on past achievement test scores.

Method

It is here that we choose to deviate from the more "traditional" extreme group research methodology in favor of using taxonomic techniques which form "natural" groups of individuals which are characterized by frequently occurring background patterns as defined by their responses to biographical items. That is, it was felt that if one can divide the total sample into frequently occurring homogeneous subclasses of individuals, rather than defining groups which are <u>extreme</u> with respect to performance on some criterion of interest, the prognosis for the generalization of any subsequent findings would be significantly improved.

The usual extreme group approach begins by defining some subclass of individuals as being extreme or non-representative with respect to the very sample on which their associated statistics are computed. Then, by some logic unbeknownst to these authors, and which seems to run counter to what we know about sampling theory, there is an expectation that these non-representative results should replicate to another independent but representative sample. The replication problem is further complicated by regression effects towards the population means as one attempts to replicate across samples drawn from the parent population of interest. Needless to say, the regression phenomena could have powerful effects in extreme group analysis, since the typical measure used to define extreme groups is generally subject to measurement error. Aside from the statistical inconsistencies inherent in this methodology, there is also the practical question concerning the usefulness of any results which only apply to a unique and small proportion of the much larger population of interest.

Thus the focus of this study is on the formation of clusters of individuals within curricula, according to the similarity of their multidimensional response patterns on biographical data. Then the various groups of individuals are examined with respect to their relative level of under- or overachievement.

If the cultural or background patterns associated with under- and overachieving groups are found to lack consistency across curricula, it can be asked if there is an underachieving group in one curriculum which is similar with respect to background patterns to an overachieving group in another curriculum. If there is indeed sufficient group overlap, we may expect to find a substantial number of individuals in the underachieving group who are more like the overachievers in another curriculum than they are like the average underachievers in their own group. That is, if we plotted the points for each individual in the multidimensional space defined by the background variables, the points of many of the underachievers would lie closer to the centroid (locus of maximum density) of the overachievers than they would to the centroid of their own groups.

The formation of homogeneous subgroups within curricula was accomplished through the use of a multiple moderator technique (Rock, Barone, & Linn, 1967). This technique iteratively searches among a set of background variables (up to a maximum of five) for those particular variables, singly or in combination, which define groups which in turn are characterized by differing relationships between criterion and a system of predictor variables. The grouping procedure used in the moderated regression is a modification of Ward's (1960) hierarchical clustering procedure applied to five background response patterns. The procedure begins with g groups and then forms g-1 groups, selectively collapsing groups which maximize the between-to-within-group sum of squares, and continues until the researcher notices a large increment in the within-group sum of squares (indicating the combining of two rather dissimilar groups), and/or until the number of individuals within the smallest group becomes large enough to provide satisfactory future statistical estimates.

Depending upon the particular objective of the study, any one of three objective functions may be used with this technique. Consistent with the purpose of this study, the objective function was selected which was designed to identify particular groups of students characterized by within-group homogeneity with respect to backgrounds, yet for whom the overall regression equation based on a battery of achievement tests results in overpredictions or underpredictions. It does this by grouping individuals according to similarity of patterns of responses to background questions, and computing the relationships between the mean grade point average (GPA) that had been predicted and the mean GPA that had actually been obtained by that group. Subtraction of the predicted values from the obtained values yields a mean residual, which is an index of the amount of overprediction (a negative residual) or underprediction (a positive residual) which characterizes that particular group.

This function enables one to identify the groups which yield the largest absolute differences in mean residual values. This will result in a system of subgroups, two of which are of particular interest--one that is characterized by overachievement, the other by underachievement (Flaugher & Rock, 1969).

Having formed clusters of individuals who are characterized by over- and underachievement within each curriculum, we then need methodology to measure the relative similarity or dissimilarity of the background profiles of the various groups. Since groups may be formed on the basis of up to five background variables, the problem becomes one of estimating the overlap among the multivariate distributions associated with each group. The centour concept as described by Cooley and Lohnes (1962), Rulon et al. (1967) appears to be well suited for this problem.

The centour score provides a good index of the extent to which an individual or group resembles another group, where the second group's means and dispersions are known. The centour method may of course be generalized to any number of variables. The centour score is the probability of obtaining a larger chi-square (χ^2); thus the χ^2 when an individual's scores are compared with the mean scores associated with a particular group with a known dispersion matrix, the less likely an individual having said scores would be a member of that population. More rigorous treatments of this application of the maximum likelihood classification procedures may also be found in Rao (1952) and Tatsuoka (1957).

Samples

Data for this study were taken from the files of the Growth Study. Four high school curricula were selected for analysis: academic, vocational, business and general. In order to get a fairly large sample with complete data cases, the subjects were selected from three different high schools. The sample sizes within each curriculum were: academic, 550; vocational, 354; business, 314; and general, 276.

Predictors

The predictors were scores on five of the Sequential Tests of Educational Progress (STEP), which were administered when the students were in the ninth grade. The five predictor scores included mathematics, science, social studies, reading and writing. The criterion was senior rank in class which was subsequently adjusted (Angoff, 1961) using the individual's School and College Aptitude Test scores (SCAT), in order to reduce differences among schools in grading practices, which may be due to differences in ability inputs.

Background Variables

The background or moderating variables were selected on the basis of past research (Rock, 1968) which seemed to indicate their potential for acting as measures of motivation. Three of the five items in particular have demonstrated moderator characteristics. One of these items was an "Environmental Participation" scale (Moderator 1), which was constructed in an effort to yield estimates of the exposure of the individual to typical middle class experiences and environmental stimulation. It is hypothesized that poverty of experiential stimulation rather than socioeconomic class would have the greater moderating effect on the regressions. The remaining two "motivation" type items were standard "family press" type biographical items which were concerned with the parents' attitudes toward school achievement (Moderator 2), and the father's attitude toward continuing on to college (Moderator 3). The fourth biographical item was concerned with the amount of nonschool related reading done, and the fifth (potential moderator) asked about time spent on, as well as interest in, vocational or technological type activities such as repairing cars, machinery, etc.

The moderated regression technique was run independently within each curriculum sample. Since the sample sizes were not sufficiently large to allow splitting into random halves within curricula, stability of the results must depend on whether or not the various success and/or failure patterns could be replicated across curricula.

Results and Discussion

Table 33 presents an 8 x 8 matrix of centour scores which indicate which of the over- and underachieving groups are most similar or dissimilar to each other, based on their group means, on the five biographical variables. Within each curricula in Table 33 there is a column of centour scores for the overachieving group and for the underachieving group. An entry c_{jk} in the matrix of centours indicates the centour score associated with group k in the group j dispersion. For example, c_{31} indicates that an individual having group 1 mean scores, an overachiever in the academic curriculum, is closer to the centroid of group 3 than are 98% of the individuals in group 3. Conversely, c_{13} indicates that an individual having group 3 mean scores lies closer to the center (centroid) of group 1 than do 89% of the members of group 1. More simply, if you wish to know which groups the underachievers in the vocational curriculum are most like, you would simply go down column 4 noting the largest entries. Thus high values on the off-diagonals indicate a high degree of overlap between the corresponding groups. Lack of symmetry in the appropriate off-diagonal elements, e.g., $c_{13} \neq c_{31}$ is due to differences in dispersions for the paired groups.

A closer inspection of Table 33 shows that in general the overachieving groups show considerable similarity with respect to response patterns on the background items. That is, the overachievers within any one curriculum were far more like the overachievers in another curriculum than the underachievers in their own or any other curriculum. In 12 possible comparisons (i.e., the overachieving group from each one of four curricula with the overachieving groups in the remaining three curricula) 10 yield centours in excess of 80. It was also encouraging to note that, with the possible exception of the general curriculum, the centour scores indicate that the background patterns for the overachievers in any one curriculum were considerably dissimilar to those of the underachievers when past achievement is held constant.

Table 33

Centours of the Centroids on Background Variables

	Academic		Vocational		Business		General	
	Over-achievers	Under-achievers	Over-achievers	Under-achievers	Over-achievers	Under-achievers	Over-achievers	Under-achievers
	1	2	3	4	5	6	7	8
	N=203	N=134	N=124	N=94	N=92	N=81	N=88	N=75
1	1.000	.112	.890	.000	.962	.362	.999	.113
2	.128	1.000	.700	.027	.361	.000	.179	.043
3	.983	.833	1.000	.000	.976	.292	.982	.170
4	.022	.064	.062	1.000	.016	.006	.017	.066
5	.429	.013	.281	.000	1.000	.004	.911	.000
6	.565	.037	.250	.000	.268	1.000	.439	.910
7	.998	.338	.964	.000	.996	.137	1.000	.011
8	.626	.457	.631	.017	.516	.954	.575	1.000

In an attempt to present a more familiar index of the extent of separation of the under- and overachievement groups within curricula than that provided by the centour score, multiple correlations were computed between a criterion of group membership and scores on the five background variables. The multiple correlations were .82, .88, .81 and .77 for the academic, vocational, business and general curriculum samples respectively. As the centours also indicated, the background variables do significantly discriminate between the under- and overachievers within curricula.

At first glance, there appears to be no consistent background pattern associated with the underachievers. However, as we shall see later on, the low centours between underachieving groups are primarily due to differences in level, rather than in the patterns, of responses to the background questions. The consistency in the similarity of backgrounds among the overachievers with respect to both pattern and level, as compared to the relative lack of similarity among the underachievers, suggests that the "paths to success" may be somewhat limited while there are more "roads" to underachievement.

Table 34 shows the centroids or vector of means for each of the over- and underachievers within curricula. Three of the five background means demonstrate a consistent pattern which is replicated over all four curricula. That is, for all four curricula, when past achievement is held constant the underachieving (1) tend to spend more time on nonschool related reading, (2) tend to have fathers who discourage their continuing on to college (high scores indicate less encouragement) and (3) spend more time on vocational or technological type activities. It should be pointed out here that it is the multidimensional pattern of the three background variables, rather than any one alone, which differentiates the under- from the overachievers. In fact, when individuals are grouped according to the level of extracurricular reading alone, the more active readers tend to overachieve in both the academic and vocational curricula. There is no such clear differentiation in the general or business curricula. It is possible that the incongruous combination of interest in nonschool-related reading and relatively negative family press may prove somewhat debilitating with respect to achievement in expected academic subject matter. It also should be noted here that reading achievement as measured by the STEP reading test has been held constant within curricula in the model used in this analysis. This, of course, suggests that given the same reading achievement level, those individuals who report spending considerable time on nonschool-related reading, in conjunction with the previously specific pattern on background variables, achieve less well than expected. As a result of looking at such complex interactions, one begins to understand why our relatively oversimplified standardized test battery prediction models may often fall short of the desired accuracy for any one given subset of the population of interest.

Table 34

Group Means for Over- and Underachievers within Curriculum

	Academic		Vocational		Business		General	
	Over-achievers	Under-achievers	Over-achievers	Under-achievers	Over-achievers	Under-achievers	Over-achievers	Under-achievers
M_1	49.05	40.89	45.97	44.77	44.91	62.21	48.41	57.08
M_2	46.61	55.66	50.91	47.77	48.04	44.88	48.09	48.05
M_3	45.00	46.49	45.42	66.81	42.48	45.18	43.81	48.07
M_4	45.62	51.59	45.35	46.62	44.82	50.65	44.22	54.78
M_5	43.38	52.57	49.26	57.18	46.67	51.97	45.45	59.14
Mean Residuals	.62	-1.07	.97	-.74	1.01	-1.07	.47	-.58
Standard Error of Mean Residuals	.4646	.5717	.7756	.8907	.7393	.7896	.8209	.8891

Indication of the relative contributions of the three background variables to the discrimination between groups characterized by over- and underachievement within curricula was obtained from inspection of the standardized partial regression weights from the multiple correlational analysis referred to earlier. The fifth moderator--time spent on vocational or technological extracurricular activities--has a statistically significant regression weight in all four curriculum samples. Reported time spent on nonschool-related reading and father's attitude towards continuing higher education were statistically significant in three of the four and two of the four curriculum samples respectively. The underachievers appear to spend considerable time on technological activities and reading material that evidently are not rewarded in the normal school grading practices. The fact that underachievers tend to report a lack of "family press" towards continuing education has also been reported in a previous study of over- and underachievement (Rock, 1968). A high level of extracurricular activities of a more general nature were found to be related to underachievement in another earlier study by Flaugher and Rock (1969). Further inspection of Table 34 indicates that although underachievers demonstrate a consistent pattern with respect to three of the background variables, the relative levels vary from curriculum to curriculum. This, of course, contributes to the lower centour scores among the underachievers.

Since most of the overachieving groups looked only like other overachieving groups, the attempt to find an underachieving group which looked like an overachieving group in another curriculum was not especially successful. However, the underachievers in the academic curriculum did show extensive overlap with respect to background response patterns with the overachievers in the vocational curriculum. That is, inspection of Table 33 indicates that the centroid of the academic underachievers is closer to the centroid of the vocational overachievers than approximately 83% of the members of that group. However, any meaningful comparison across curricula would have to include aptitude information in addition to background patterns. That is, an underachiever in the academic curriculum could have the same background pattern as an overachiever in the vocational curriculum, yet his aptitudes may still be inappropriate. Since there was no opportunity for replication of this finding in this study, these results can only serve as a means for future hypothesis generation.

Summary and Conclusion

Methodologies were proposed for combining background and aptitude and/or achievement information in an approach to the classification problem using the concept of under- and overachievement. The methodologies were applied to independent samples from four high school curricula. The results suggested that when past achievement and/or aptitudes were held constant (1) groups characterized by overachievement in all four curricula had similar backgrounds as defined by their level and pattern of response to five biographical items, (2) groups characterized by underachievement in the four curricula appeared to have similar response patterns but had more variation with respect to level, and (3) underachieving groups, regardless of curricular choice, reported that they spent more time on extracurricular technological projects than did overachieving groups. To a somewhat lesser extent, underachievers tended to have fathers who discouraged their going on to college and the underachievers also tended to spend more time on extracurricular reading.

The results also suggest that the "natural" grouping technique proposed here may increase the possibility of replication from sample to sample, while not leading to particularly exciting or extreme results within any one given sample.

Chapter 11

College or Employment and the High School Curriculum

Jonathan R. Warren[1]

Since the turn of the century, secondary education in the United States has operated as a dual system. Some students are to be prepared for college; others are to be prepared for employment, citizenship, and homemaking. Although the point has been and continues to be disputed, the two kinds of preparation presumably require different curricula.

The dual curriculum was largely an outgrowth of the sharp increase in high school attendance in the 1890's, when the high school population increased 250 percent (Krug, 1969). No comparable increase in college attendance occurred until the decade of 1955 to 1965. During the first half of the present century, then, although debate over the issue was lively, justification for a dual high school curriculum was not difficult to provide. No one questioned the appropriateness of the high school's role in preparing students for college. But since only a minority of high school graduates went to college, a separate curriculum for the non-college-bound also seemed appropriate.

Part of the curricular debate in the early 1900's was over the extent of differentiation that should be provided. Commercial, trade or vocational, agricultural, homemaking, and general curricula have all held strong positions through the years as sensible alternatives to the college-preparatory curriculum. Yet differentiation among the various non-college-preparatory curricula has never been great, compared with their differentiation from the college-preparatory curriculum (Kliebard, 1968; Krug, 1969). With respect to academic aptitude and achievement, for example, mean scores in the non-college curricula tend to cluster together, while the college-preparatory mean is substantially higher (Cooley & Lohnes, 1968; also see Chapter 6). Decisions early in high school between a college-preparatory or non-college-preparatory curriculum have been considered particularly important because of their implications for later career decisions, while choices from among the several non-college curricula are less critical (Katz, 1963a).

The now traditional curricular split early in high school between those bound for college and all others may no longer be defensible. The recent acceleration in college

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[1]Cathleen Patrick, in programming the analyses carried out, very ably played an essential part in the study here reported.

attendance, a shifting association between education and occupational accomplishment, and changes in the structure of higher education all raise new questions about the usefulness of a distinction in high school between the college-bound and the non-college-bound.

Nationally the ratio of fall college entrants to high school graduates of the preceding June is estimated at .60, compared with .35 in 1940 (American Council on Education, 1970). While the proportion of high school graduates who go to college has risen substantially in recent years, about 40 percent still can be expected not to enter college. While dwindling in number, the non-college-bound students seem still numerous enough to justify curricula that are not explicitly directed toward college preparation. But identifying who will and who will not enter college in time to adjust their high school programs accordingly is as difficult as it has ever been. Moreover, as the proportion of college-going high school graduates climbs, early identification of the college-bound student becomes more difficult, and the number of college entrants who do not stay beyond a term or two grows as well. The value of a three-year high school curriculum to prepare students for an uncertain entry into college and a stay that may be no longer than a few months seems questionable.

That an increasingly complex technology requires a better educated labor force is so commonly stated as to have become trite (Burt, 1967; Stambler, 1965; Venn, 1964). Yet the nature of the association between level of education and occupational performance is beginning to be examined more critically than in the past (Berg, 1970; Lecht, 1967; Wolfle, 1970). One view holds that a college degree is growing in importance as a requirement for an increasing number of entry occupations. Another view acknowledges that the first view is true, but only in a de facto sense--the formal education of college is considered not intrinsically necessary in many jobs that require a college degree for entry. Neither view denies that the average complexity of jobs is growing and that some kind of systematic occupational training is widely necessary (Lecht, 1967; Myrdal, 1965); they differ in the role seen for schools and colleges in occupational preparation. Even those who consider a college education an artificial requirement for many jobs agree that high school graduation is likely to be followed by some form of post-secondary education. The diversity of programs and purposes at that level, however, makes college preparation in the traditional high school mold too narrow a goal.

The recent burgeoning junior college movement and the pressure for open admission to public four-year colleges are two developments that are changing the structure of higher education. College-level institutions of all types are under pressure to admit students who either choose not to, or are unable to, perform in ways traditionally expected of college students. Colleges adapt to the influx of students who are poorly qualified in the usual academic sense, either by relaxing academic requirements or by broadening the type of instructional program offered. The result is further diversity in college programs. If the purpose of a high school curriculum is to prepare students for college, a uniform, undifferentiated curriculum for that purpose seems unrealistic.

All these developments, then--the growing proportion of high school graduates who are entering college, the growing complexity of jobs at all levels, and the increasing diversity of college-level programs--make the curricular distinction in high school between those who are college-bound and those who are not seem rather dubious. The present report, in describing the associations among high school curriculum, post-high-school activities, socioeconomic background, and academic aptitude, examines further the college/non-college distinction in high school curricula. The data will be examined in relation to two questions:

1. To what extent can post-high-school behavior be usefully and unambiguously classified as college versus non-college?

2. How is the high school curriculum associated with post-high-school behavior in conjunction with the student's socioeconomic background and academic aptitude?

The high school graduates studied

The entire high school graduating classes of 1967 from 26 high schools in 17 communities from coast to coast were surveyed in the late spring of 1968, almost a year after graduation. The communities were chosen not as a sample from a defined population of communities, but as a diverse group with respect to size, type, and location, that could be expected to reveal a wide range of school and post-school patterns of performance. Responses indicating post-high-school activities were received from 5,542 graduates--76 percent of a total high school senior population of 7,282. Data on high school curriculum, aptitude, and social class had been collected from the same students when they were in the eleventh grade.

Educational attainment

The student characteristics most commonly studied in relation to performance both during and after graduation are academic aptitude, sex, and socioeconomic status or social class. These variables are widely known to be associated with high school curriculum (Flanagan & Cooley, 1966; Greer & Harbeck, 1962; also see Chapter 6) and with college attendance (Douvan & Kaye, 1962; Duncan, Featherman & Duncan, 1968; Flanagan & Cooley, 1966; Schoenfeldt, 1966; Sewell & Shah, 1967; Trent & Medsker, 1968). Yet the individual and interactive effects of these variables in their association with educational attainment are difficult to distinguish in the tot ' network of relationships.

One method for estimating the direct and indirect effects among a set of variables for any presumed causal pattern is path analysis (Borgatta, 1968; Duncan, 1966). Path diagrams, as in Figure 27, indicate the presumed direction of causality. The path coefficients indicate the amount by which the variable at the head of an arrow is changed, independently of other effects, by a unit change in the variable at the tail of the arrow, when both variables are expressed in standard scores.

For computing the path coefficients of Figure 27, educational attainment was measured in terms of the following set of five ordered categories:

1. Not in college, no plans for college
2. Not in college, plans to enroll later
3. In college, probably will not complete four-year degree
4. In a two-year college, plans to complete a four-year degree
5. In a four-year college, plans to complete a four-year degree.

The above scale makes no distinction between those in two-year and four-year colleges who do not plan to complete a degree. This acknowledges the attendance in four-year colleges of some students who plan only for a limited college experience without a degree. They use the four-year college (or, more likely, a state or municipal university) as if it were a two-year college. The distinction between attendance at two-year and four-year colleges among students saying they plan to complete a four-year degree is intended to account for the large proportion of junior-college students who say they plan to complete four years of college but who never actually transfer.

The scale is partially based on plans as well as on actual educational attainment. Even the plans, however, reflect a year's experience in college. Plans that might have

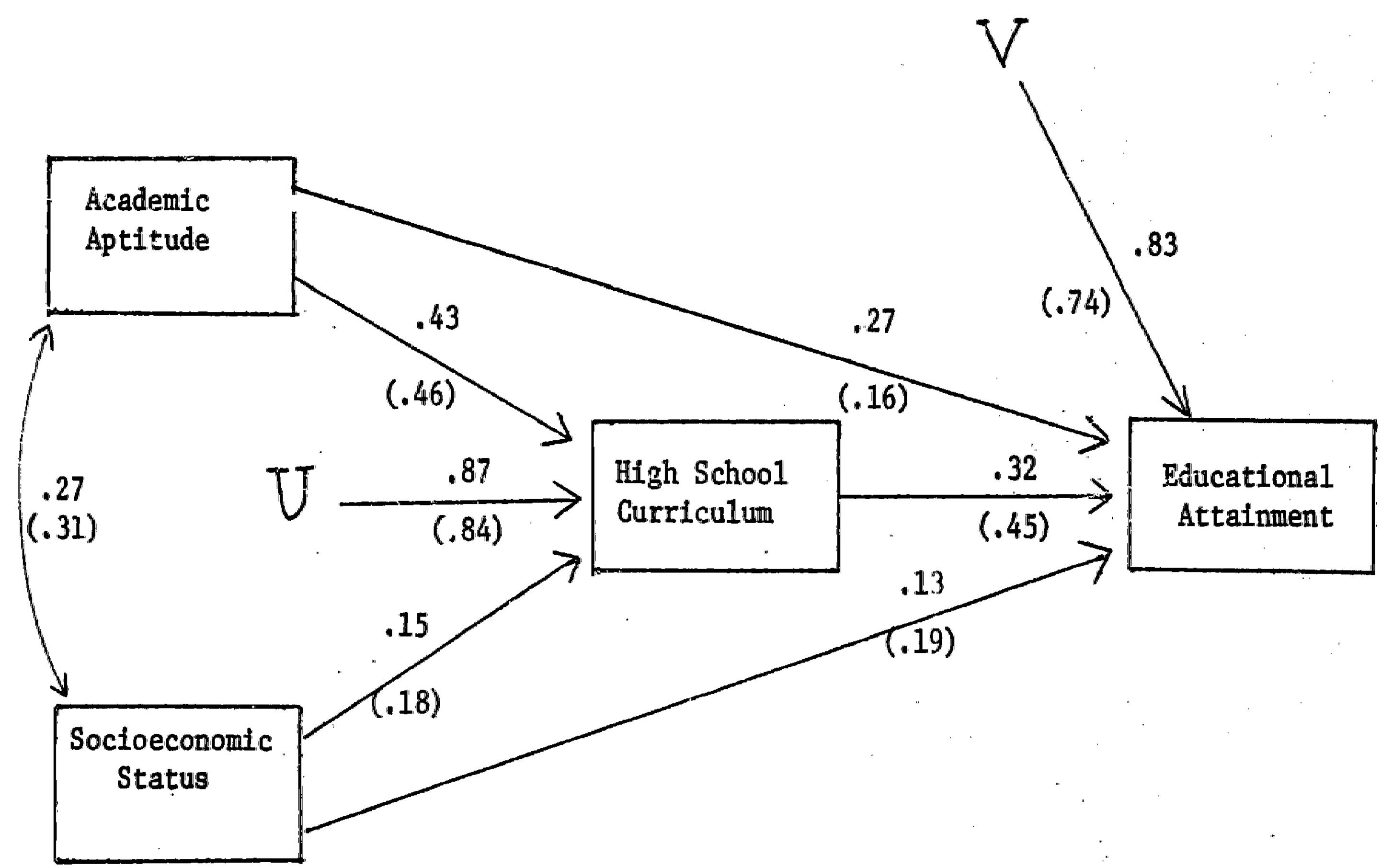

Figure 27. Path coefficients associating aptitude, socioeconomic status, and curriculum with educational attainment one year after high school graduation. (Figures above the arrows are for men; those below and in parentheses are for women.)

been nebulous at high school graduation can be expected a year later to have been modified in accordance with the intervening college experience. Plans at that point for a four-year degree might reasonably indicate a higher level of actual educational accomplishment than would plans for only limited further college attendance.

High school curriculum was scored either college-preparatory or non-college-preparatory because of the sharp distinction between those two categories as compared with distinction among the several noncollege curricula. In some instances, however, the distinction was blurred, as in the case of an agricultural curriculum that leads into a college of agriculture. Data from students who could not be unambiguously classified into a college or non-college curriculum were discarded.

Socioeconomic status was scored on an index having values ranging from 11 to 77, based on scaled values for the father's occupational level and education (or the mother's education if the father's education was unknown). The Verbal subtest of the School and College Abilities Test (SCAT) administered in the eleventh grade provided the measure of academic aptitude.

Correlations among the four variables and means and standard deviations are shown in Table 35 The path diagram, with coefficients for men and women entered separately, is shown in Figure 27.

The path coefficients are quite similar for men and women in their relative magnitude, even though the generally higher correlation coefficients for the women, shown in Table 35, lead to somewhat higher path coefficients. For both sexes, aptitude affects both the high school curriculum entered and educational attainment after high school, as does socioeconomic status to a much smaller degree.

For men, the independent effect of aptitude on educational attainment through the first year after high school is about as strong as the effect of curriculum. Among women, the curricular effect is stronger than the independent effect of aptitude. For both sexes, socioeconomic status has a smaller but still appreciable effect on educational attainment.

The role of aptitude and social class in affecting choice of curriculum enlarges their total effect on post-high-school educational attainment. Determiners of high school curricular choice, however, are not central to a discussion of outcomes of the curriculum followed. More pertinent is the effect on educational attainment of undetermined variables, represented in Figure 27 by the variable V. Slightly more than 30 percent

Table 35

Correlation Coefficients, Means, and Standard Deviations for Educational Attainment, High School Curriculum, Academic Aptitude, and Socioeconomic Status by Sex

	Aptitude	Socioeconomic Status	High School Curriculum	Educational Attainment
Aptitude	1.000	.269	.472	.454
Socioeconomic Status	.306	1.000	.264	.289
High School Curriculum	.520	.325	1.000	.480
Educational Attainment	.448	.383	.590	1.000
Men (N=1948[a]):				
Mean	286.0	45.1	0.69	3.43
Standard Dev.	14.8	17.1	0.46	1.61
Women (N=2352[a]):				
Mean	284.5	42.8	0.56	3.01
Standard Dev.	14.6	17.3	0.50	1.73

Note. --Correlations for men are above the diagonal; for women, below.

[a]N's vary across cells because of missing data. Those shown are the numbers of respondents to the post-high-school survey. Other N's are generally larger.

of the variance in educational attainment for the men, and 40 percent for the women, can be associated with the combination of aptitude, social class, and high school curriculum. These probably are underestimates, however, because they require an assumption of perfect reliability in all the measures involved when, in fact, every measure has some error associated with it. Further, the "variance" in an ordinal scale is difficult to interpret, and a measure of educational attainment on which the intervals were equal might give different results. Nevertheless, the combined effects of high school curriculum, aptitude, and social class seem rather small in relation to the effects of other unknown variables.

Educational attainment is somewhat more predictable for women than for men, with almost half its variance attributable to curriculum, aptitude, and social class. The strong curricular effect for women is due primarily to the large proportion of women who follow a non-college business curriculum, and then go directly into employment after high school.

Post-high-school activities

The most effective tie between high school curriculum and post-high-school activities seems to be in the high school programs that prepare girls for office and clerical work. Large proportions of girls go from those programs into related employment. Statements of their work activities by employed persons three years out of high school--another group surveyed in the study--indicated office and clerical jobs to be by far the most common type of employment held by either men or women. Relatively few men, however, had had the clerical training found in girls' business curricula.

College-preparatory curricula, for those who follow an academic program in college, may also be closely tied to post-high-school activities, since a large proportion of those from a college-preparatory curriculum do enter college. But the relationship may be less close than it appears. The diversity of college fields and programs to which a relatively standard college-preparatory curriculum is expected to lead makes questionable the effectiveness of the high-school-to-college match. In contrast, the clerical activities of office jobs can be closely related to a business curriculum.

Tables 36 and 37 show the numbers of high school graduates, separately for each sex, in each cell of a three-way breakdown by post-high-school activity, curriculum, and socioeconomic status. The total number of persons represented is smaller than that on which the preceding path

Table 36

Frequencies of Post-High-School Activity by Curriculum, Socioeconomic Status and Sex

Post-High-School Activity	Curriculum			
	Academic	Vocational Business	General	Total
		Men		
High Socioeconomic Status				
Student	467	54	50	571
Employed	54	41	31	126
Military	25	18	6	49
Unemployed	30	5	9	44
Total	576	118	96	790
Low Socioeconomic Status				
Student	198	54	22	274
Employed	52	62	49	163
Military	24	24	10	58
Unemployed	17	6	7	30
Total	291	146	88	525
All Men	867	264	184	1,315
		Women		
High Socioeconomic Status				
Student	514	34	27	575
Employed	64	75	40	179
Housewife	28	15	13	56
Unemployed	29	14	7	50
Total	635	138	87	860
Low Socioeconomic Status				
Student	209	41	16	266
Employed	51	204	47	302
Housewife	35	37	34	106
Unemployed	26	24	12	62
Total	321	306	109	736
All Women	956	444	196	1,596

Table 37

Adjusted Frequencies of Post-High-School Activity

by Curriculum, Socioeconomic Status and Sex

Post-High-School Activity	Curriculum			
	Academic	Vocational Business	General	Total
		Men		
High Socioeconomic Status				
Student	403	146	197	746
Employed	47	112	124	283
Military	21	49	24	94
Unemployed	27	14	36	77
Total	498	321	381	1,200
Low Socioeconomic Status				
Student	206	176	105	487
Employed	54	204	234	492
Military	24	79	47	150
Unemployed	18	20	33	71
Total	302	479	419	1,200
All Men	800	800	800	2,400
		Women		
High Socioeconomic Status				
Student	447	66	117	630
Employed	56	148	174	378
Housewife	24	29	56	109
Unemployed	25	27	31	83
Total	552	270	378	1,200
Low Socioeconomic Status				
Student	161	71	62	294
Employed	40	352	182	574
Housewife	27	65	132	224
Unemployed	20	42	46	108
Total	248	530	422	1,200
All Women	800	800	800	2,400

analysis was based, consisting of the 57 percent of the total sample who had responded at the same time the analysis was made. The path analysis includes the additional 19 percent who responded later.

For these breakdowns, three categories of curricula were used, differentiating a general curriculum from vocational curricula for boys and business or commercial curricula for girls. Post-high-school activities--whether in college, employed, in military service, unemployed, or a housewife--rather than educational attainment, represented the outcome variable. Military service was not included as a category for women; the few women who did fit that category were excluded from the analysis. And housewife was not considered a reasonable category for men, even though a few of the unemployed men were married and may have stayed home while their wives worked. The socioeconomic scale was split into only two categories--high and low--to give every cell an expected frequency of at least 5.

The cell frequencies of Table 36 show clearly that the typical person, among both men and women, was someone above the middle with respect to social class who graduated in an academic curriculum and went to college. This type of person accounts for 36 percent of all the men and 32 percent of the women. Another 15 percent of the men and 13 percent of the women from the lower socioeconomic levels also went from an academic curriculum in high school into college. The only other large group, consisting of 13 percent of the women, were from lower socioeconomic levels, graduated from a business curriculum, and were employed.

Comparison of the figures in the table, and of the percentages just given, is difficult because of the different total numbers of subjects in each curriculum or social class category. More college students came from the academic curriculum than from the other curricula, but more high school graduates were in an academic curriculum to begin with. Citing percentages rather than frequencies helps, but a number of different bases (total number in a curriculum, total number in a current post-high-school activity, total number in a given social class level, total of all respondents, etc.) can be used to compute the percentages, each one providing a different kind of information.

To make interpretation simpler, the cells of Table 36 were multiplied by a suitable constant to make the social class and curriculum totals for each sex equal, while preserving the relationships among the individual cells. This procedure shows the cell frequencies that would have existed if the number of students from each level of social class and from each of the three curricula had been equal, and if the relationships among curricula, social class, and current status remained as indicated by the original data (Mosteller, 1968).

The results of this adjustment are shown in Table 37 The overall column totals have been adjusted to a constant 800 people of each sex in each curriculum, and 1,200 at each social class level. The totals in each category of post-high-school status were left free to fluctuate, retaining their original relationship to social class and curriculum as the social class and curriculum frequencies were adjusted. If no relationship existed among the three variables, the cell frequencies would all fluctuate randomly about 100. Direct comparisons of the adjusted frequencies in each cell are therefore possible.

The effects of the adjustment can be illustrated by comparing the top row of Table 37 with the top row of Table 36. The actual frequencies of Table 36 show that, among men from the upper social class levels, nine times as many college students were from a college-preparatory curriculum as from either a vocational or general curriculum. The adjusted figures of Table 37, however, show that if equal samples of men had been drawn from each curriculum and from the upper and lower portions of the socioeconomic scale, the number of college men from the upper social class levels and an academic curriculum would have been only two or three times as great as the number from either non-academic curriculum, and not much larger than the total number from non-academic curricula. The numbers of college students from non-academic curricula are greater proportionally than the actual frequencies make them appear because of the small total number in the non-academic curricula.

At the lower socioeconomic levels, the relationship between curriculum and college attendance is still weaker. If social class and curriculum categories are equalized, about 35 percent more college students in the lower portion of the socioeconomic scale appear from non-academic curricula than from a college-preparatory curriculum.

Difficulty in understanding what is implied by the large number of male college students from non-college-preparatory curricula illustrates some of the difficulty inherent in a college/non-college curricular distinction in high school. Graduates of vocational curricula who entered occupational programs in junior colleges, perhaps closely related to their high school programs, make up some of the college students from vocational curricula. Nevertheless, even the occupational programs in junior colleges often include academic requirements that parallel the freshman English and mathematics requirements in four-year colleges. With two-thirds to three-fourths of junior college students at least nominally in transfer programs, a very small proportion of the college students in the present study can be considered to be following a program for which a non-college high school curriculum gave them appropriate preparation.

Men and women from the college-preparatory curriculum entered college in approximately equal proportions--77 percent of the men and 76 percent of the women. But from all curricula, 64 percent of the men and 53 percent of the women entered college. The overrepresentation of men relative to women entering college is attributable, in this sample, entirely to graduates of vocational, business, and general high school curricula. Whether academic curricula do their college-preparatory job well or not, they show no sex bias.

The business curriculum for women also seems to be reasonably appropriate. In view of the number of women likely to be following a business program in college, finding 17 percent of the women graduates of a high school business curriculum in college seems reasonable.

The range of activities of general curriculum graduates of both sexes, and of male vocational curriculum graduates, indicates that these curricula must provide quite diversified kinds of preparation if they are to be effective. Among men, excluding those in military service, the proportion of general curriculum graduates who entered college is nearly equal to the proportion who entered employment. Among the women, more general curriculum graduates entered employment than entered college, but only 24 percent can be classified as primarily housewives. Even three years after high school graduation, only 25 percent of the women general curriculum graduates in two large cities could be classified as housewives. A general curriculum must therefore be what its name implies--a broad preparation for whatever activity its graduates should later select. It cannot just prepare women to be housewives and consumers or men to be employed in low-level, nontechnical jobs. Whether a single curriculum that is essentially uniform in its content can effectively accomplish the various purposes of a general curriculum seems questionable.

A vocational curriculum for high school boys must serve the same varied functions that a general curriculum serves. More than 40 percent of the male graduates of a vocational curriculum, but only 17 percent of the women business graduates, entered college.

Interaction effects

The figures in Tables 36 and 37 show quite clearly that, one year out of high school, most of the college students had come from an academic curriculum, and that more were from the upper socioeconomic levels than from the lower. This is hardly surprising. Whether social class and high school curriculum interact in their effect on college attendance is not so obvious. Is their effect simply additive or does one either amplify or restrain the effects of the other? The path analysis of Figure 27 separates their effects but does not show their interaction.

Chi-squares computed for the three-way table of post-high-school status by curriculum by social class (Winer, 1962, pp. 629-632), separately for each sex, showed all two-way interactions to be statistically significant, as is obvious simply from inspection of the table. The three-way interaction was not statistically significant. No two variables, therefore, interact in their effect on the third; they simply add their independent effects. A boy in a high socioeconomic level, for example, who has followed a vocational curriculum in high school has the same advantage due to social class over his vocational curriculum peers in the likelihood of his college attendance that high social class gives to college-preparatory students. His enrollment in a vocational curriculum neither reduces nor enhances the influence of socioeconomic status on college attendance.

Three years after high school graduation

At the same time the data just reported were being collected, similar information was collected from the graduates of two years earlier, in 1965, from the high schools in two of the larger cities in the study, one in the East and one in the West. Questionnaires were sent to 1,639 graduates of four high schools in the Eastern city and to 2,631 graduates of six high schools in the Western city. Completed questionnaires were received from 1,010 or 62 percent, of the Eastern graduates and 2,048, or 78 percent, of the Western graduates.

Because the persons in this analysis had been out of high school three years instead of one, the more detailed ordinal scale of educational attainment described below was used.

1. No college experience; no plans for college
2. No college experience; plans to enter college
3. Less than one year of college completed; not now in college
4. Less than one year of college completed; still enrolled in college
5. One but less than two years of college completed; not now in college

6. One but less than two years of college completed; still enrolled in college
7. Two or more years of college completed; not now in college
8. Two or more years of college completed; still in college, but a degree unlikely
9. Two or more years of college completed; still in college; plans to complete a four-year degree
10. Two or more years of college completed; still in college; plans for graduate study.

Frequencies and percentages of persons in selected intervals on the scale above, for the two cities and both sexes, are shown in Table 38. Immediately apparent are the small differences between sexes in either city and the substantial differences, for both sexes, across cities. In the Western city, where several junior colleges and four-year institutions are within commuting distance, all but about one-fifth of both men and women had had some college experience. In the Eastern city, where the only institutions of higher education are a small two-year extension center of the state university and two small Catholic colleges, over 40 percent of the men and more than half of the women had had no college experience.

The differences between the cities are smaller at each higher level of educational attainment, but are still present at the highest level. The percentages of men planning on graduate study are 15 and 20 percent in the Eastern and Western cities respectively. Corresponding figures for the women are 6 and 14 percent.

The ambiguity inherent in designating high school students as college-bound or not is illustrated in the data summarized in Table 38. From about 25 to 40 percent of the high school graduates, depending on sex and city, had been college students during all or most of the three years since leaving high school. But another 20 to 40 percent, again depending on sex and city, had been in and out of college, some having started and stopped and others having entered late. Students currently in college but having completed less than two years, indicating a late start or some other delay, made up from 2 to 12 percent of the four groups. The larger proportions of current but delayed students were in the Western city, where a variety of institutions of higher education are available.

Path diagrams, showing the effects of academic aptitude, socioeconomic status, and high school curriculum on educational attainment three years after high school graduation are in Figure 28. The path coefficients leading to educational attainment three years after high school show the same general order of magnitude as those associated with educational attainment one year after graduation. High school curriculum has a

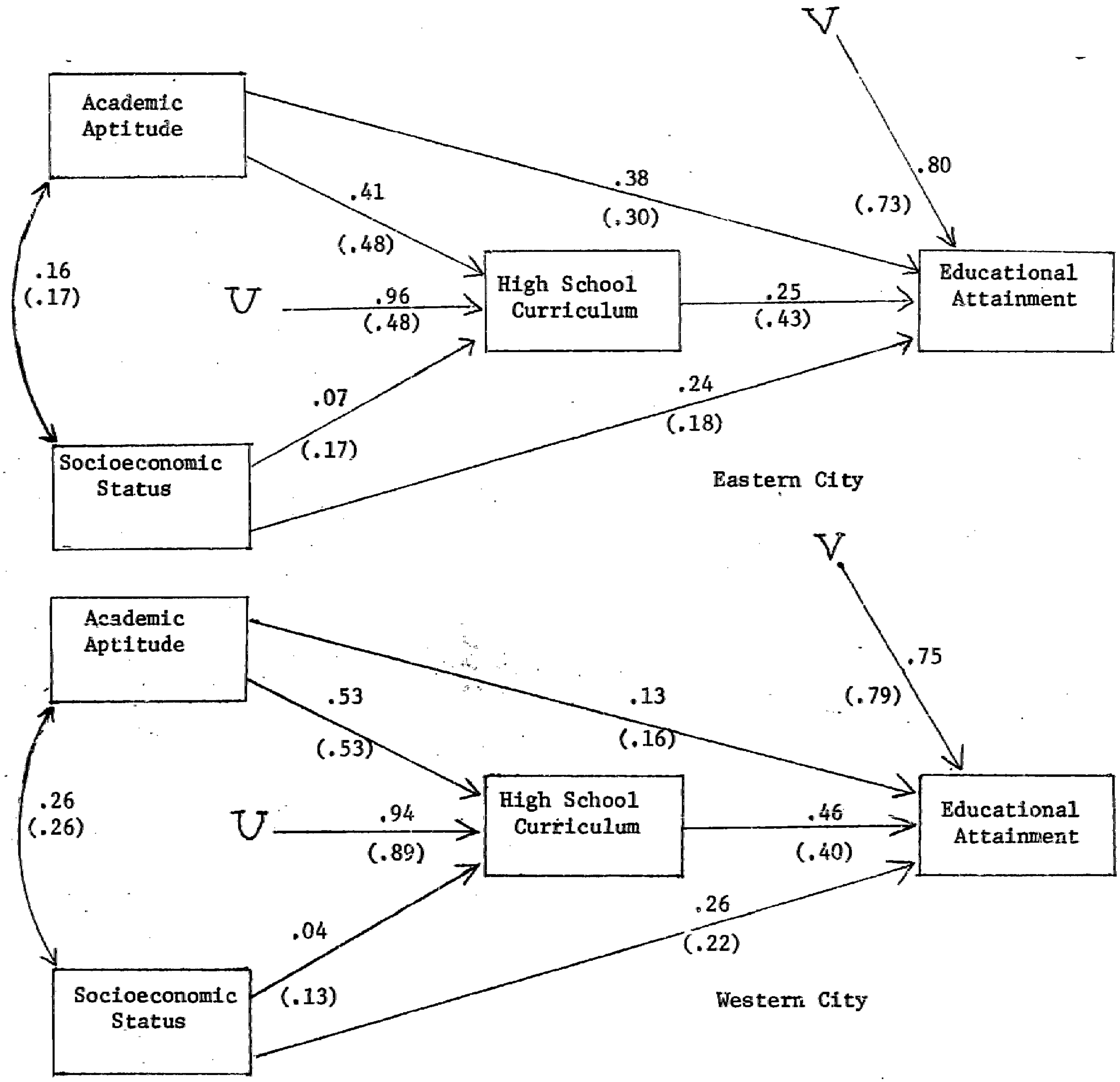

Figure 28. Path coefficients associating aptitude, socioeconomic status, and curriculum with educational attainment three years after high school graduation. (Figures above the arrows are for men; those below and in parentheses are for women.)

Table 38

Educational Attainment by City and Sex

Educational Attainment	Eastern City				Western City			
	Men		Women		Men		Women	
	N	%	N	%	N	%	N	%
Two years of college or more; still in college	146	34.6	124	26.2	177	42.5	209	36.6
Some college, but not now enrolled	95	22.5	91	19.2	161	38.8	239	41.7
No college experience	181	42.9	259	54.7	78	18.8	124	21.7
Total	422	100.0	474	100.1	416	100.1	572	100.0

substantial effect, but extraneous variables are required to account for more than half of the variance in educational attainment.

Discussion

The data on post-high-school behavior three years after high school graduation show that almost as many persons have been in and out of college as have entered directly from high school and progressed into the third year. A curricular distinction based on anticipated college attendance seems questionable for that reason alone. Should someone who will attend college for one year or less direct his high school activities toward preparation for that one year? Does "going to college" mean simply entering college or entering and then reaching some collegiate level of education? The uncertainty implied in these two questions indicates that any definition of "college attendance" that is unambiguous will have little practicality. Planning three years of high school around a classification that uncertain seems hardly justified.

The sizable numbers of graduates of non-academic curricula who enter college, and of college-preparatory graduates who do not, indicate that predictions in high school of college attendance are quite uncertain. That uncertainty is a second reason for questioning the usefulness of a college/non-college curricular distinction. If different kinds of preparation are really necessary for college and non-college post-high-school activities, then non-academic curricula must assume some burden of college preparation, and academic curricula have a corresponding responsibility to prepare their graduates for employment. Any other conclusion would require an unrealistically accurate selection or decision procedure in the early years of high school.

A third problem in designing a high school curriculum explicitly for college preparation is the growing diversity of college programs. Some, particularly in junior colleges, are strongly vocationally oriented, yet retain academic requirements as well. Even within colleges of letters and science, the differences between fields like chemistry and English literature are great enough that a single preparatory path to both seems unrealistic.

Throughout the present century, the argument for a single, undifferentiated high school curriculum has persisted in spite of its failure to prevail in practice. A current version of the single-curriculum argument would hold that the diversity of post-high-school activities is so great that high school programs cannot hope to provide preparation specific to any particular post-high-school activity. All must be equally accommodated, and the traditional academic program, because of its heavy intellectual component, is believed to perform this function well.

A fundamental problem in most of the debates over curricular differentiation in high school is the presumption that high school programs must lead to a goal specified by or for the high school student, and they must therefore be planned in terms of the goal for which they are intended. The data of the present study point up the uncertainty inherent in any specification of post-high-school goals, and the single-curriculum argument draws some of its strength from that uncertainty. Problems in determining what a student's post-high-school activities will be, however, do not imply that high school programs cannot be usefully differentiated. They only imply that the basis for differentiation should not be the expected or desired post-high-school activities of the student.

A variety of potentially useful ways of differentiating high school curricula are possible. Student preferences for dealing with persons rather than things, for the concrete rather than the abstract regardless of level, for self-directed and flexible programming as opposed to an externally structured program, or for a highly focussed program toward an explicit goal in contrast to a broad-ranging exploratory program, all provide reasonable ways of organizing high school learning activities to accommodate the variety of student capabilities and inclinations most high schools are faced with. The primary advantage of these kinds of distinctions among students, in contrast to the college/non-college distinction, is their basis in current student attributes rather than in somebody's expectation or aspiration for the student several years hence. Even the goal-oriented/exploratory distinction acknowledges current differences in the future/present time orientation of high school students.

In short, instead of curricular distinctions being based on students' post-high-school plans, with all their uncertainty, post-high-school activities could be permitted to follow naturally from student preferences that arise from their experiences in high school programs that are themselves geared to existing student attributes. This does not mean basing curricula on juvenile interests, thereby locking in current interests and inhibiting growth. It does mean that the form or style of the learning activities with which various subjects are approached might well be varied to accommodate differences in students' current inclinations. Changes and growth in student interests and inclinations need not be inhibited. The present almost universal practice of designating high school students as either college-bound or not seems far more restrictive of student growth.

Summary and Conclusion

A questionnaire survey of the college and employment activities of about 5,500 high school graduates one year out of high school, and of about 3,000 graduates three years out of high school, showed the high school curriculum the students followed to be only moderately related to what they did after high school. Academic aptitude and the parents' socioeconomic status were associated with the high school curriculum followed and with amount of post-high-school education, independent of curriculum. Aptitude, socioeconomic status, and curriculum combined, however, still left a high degree of uncertainty in the educational level that would be reached.

Particularly among the men, large proportions of graduates of non-academic high school curricula entered college, and smaller but still sizable proportions of college-preparatory graduates entered employment. The three-year pattern of post-high-school activities showed that as many graduates had completed three years of college as had had no college at all. But almost as many had been in and out of college, starting late or dropping out, and working in the periods between enrollments.

The uncertainty in predicting entry into college and the variety of educational experiences that follow college entry, including wide variation in the amount of college completed, raise questions about the usefulness of differentiating high school curricula on the basis of expectations about college attendance or employment after high school. Alternative ways of differentiating high school curricula, based on current student characteristics rather than plans or expectations, are suggested.

Chapter 12

Summary and Conclusion

Thomas L. Hilton

What can we say in summary about the vocational development of U. S. students from the fifth to the twelfth grades? The answer can be given in a number of ways. In one sense we can say a great deal and in another not very much. The "not very much" answer is imposed on any research in this area by the extraordinarily difficult methodological problems which are encountered, directly reflecting the general lack of verified knowledge about the processes under study. Much of the Study's resources were expended towards the solution of these methodological problems and the progress made will be summarized shortly. These methodological advances may prove in the long run to be the major contribution of the Study.

But the staff's time was by no means devoted entirely to methodological issues. A huge data file was analyzed, leading to descriptive results of substantial interest to both researchers and practitioners in vocational development. The findings of these studies will be discussed after the methodological work is summarized. This final chapter, however, will only highlight the work which was done; each separate chapter should be consulted for further summary information.

Methodological Findings

To evaluate the effect of a developmental variable--enrollment in a particular curriculum program, for example--we would ideally like to design a study with features such as the following:

1. Random selection of schools and random assignment of students to treatment groups within schools.

2. Repeated measurement without practice effects.

3. No loss of students from samples.

4. Precisely relevant and valid measures.

In many ways the Growth Study sample and data file stack up quite well against the ideal. The sample is not a random sample of the public schools in the nation but, as pointed out in Chapter 5, it quite closely approximates samples which were randomly drawn. The cognitive measures available in the Growth Study file represent a valuable asset in that they were administered every two years, from the fifth to the eleventh grades. Different tests were administered each time, which reduced any practice effect there might have been, and the tests were designed to be appropriate in content and difficulty level for students at the age levels to which they were given. The students accepted the test administrations as reasonable assignments and were cooperative. Very few unusable answer sheets were returned (less than .1%).

Furthermore, the data were repeatedly checked for quality during the scoring and data storage processes and these checks indicated that, despite the many transformations of the data, the accuracy of the data file is exceptionally high. The sample was followed one year after graduation, which provided information on the stability of plans and intentions which the students reported during high school, and for a fraction of the sample a three year follow-up was conducted as a check on the stability of the students' initial post-high-school occupational and educational involvements.

Thus on a number of counts the Growth Study design and data file have unusual strengths. The authors know of no other nationwide study of academic growth in which a battery of cognitive measures has been administered four successive times over as long a period. But there are some obvious weaknesses which will be discussed along with some steps taken to overcome them.

The most obvious weakness, by no means unique to the Growth Study, is that the treatment groups within the schools were not randomly selected. Few students or parents would tolerate random assignment to various curriculum programs. Nor would they tolerate random assignment to the schools within the particular school system. Even if such random assignment were possible, the spread-of-effect problem and the problem of maintaining intact samples over long time periods would be severe. How could you prevent migration from one program to another within schools and from one school to another within systems? Thus the Growth Study necessarily relied on naturalistic data, and the staff was forced to deal with the confounding and ambiguities which inevitably accompany efforts to analyze and interpret such data.

Probably the main problem one encounters in dealing with naturalistic data is self-selection, resulting in initial scores of the groups under study that are not comparable. The mean ninth grade SCAT and STEP scores of the business students, for example, are substantially lower than those of the ninth-grade college preparatory students. To adjust for such initial differences, the staff ordinarily used programs for multivariate analysis of covariance. Patton's study of the interaction of school curriculum, sex, and socioeconomic status (Chapter 6) and Rosenberg and Hilton's study of Negro-white differences (Chapter 8) are examples of the use of multivariate analysis of covariance. These analyses are regarded, in retrospect, as having provided useful results. It is important, however, to keep in mind the various caveats which were offered in the chapters describing the studies (e.g., the unequal cell frequencies). Also, serious questions can be raised about the meaningfulness of covariance adjustment with data of these kinds. What logic is there in asking what difference it would make if the groups in question has been equal initially, when in fact they were not?

Moderator Variable Model

A somewhat different approach to the problem of multivariate analysis of naturalistic data was referred to as the moderator variable model. In the method used, which differs from the usual method, the problem of identifying treatment effects is approached by means of a two-step process. First, within each treatment group (a curriculum program, for example), groups of overachievers and underachievers are identified in terms of background variables. Second, the characteristics of the over- and underachieving groups are compared across curricula. If a group of students which performed very well in one curriculum is similar to a group of students which performed poorly in another curriculum, then we may hypothesize a differential program effect on the performance of students with the particular characteristics identified.

Rock's promising work on this model is described in Chapter 10. Generally speaking, the overachieving groups were similar across curricula; thus the attempt to find an underachieving group in one curriculum which looked like an overachieving group in another curriculum was not especially successful. Rock and Evans did, however, find one group of underachievers in the academic curriculum that had many characteristics in common with the overachievers in the vocational curriculum. The finding was not replicated, however, and must be regarded as a basis for future hypothesis generation.

Underlying Variables and Errors of Measurement

We view multivariate analysis of covariance and moderated prediction as useful analytical devices for exploratory analysis of multivariate naturalistic data. There remain, however, serious unsolved methodological problems. First, in designing any analysis for the study of vocational development, it is necessary to consider what career choice represents. The change in choice from engineer to physicist, for example, or a stable choice of engineer may both be symptoms of a continuing interest in quantitative relationships. If there is an underlying process of which career choice is a symptom then there might be other symptoms of that process. Math grades and a hobby of number puzzles, for example, may be other symptoms of interest in quantitative relationships. The analytical implication is that the association between the symptoms should be conceptualized as due to an underlying factor. The association between some hypothesized causal factor and a symptom may be an indirect reflection of the influence of that cause on the underlying factor or process.

Second, in most research in this area it is likely that all variables, symptoms or otherwise, include random and/or correlated errors of measurement which may yield attenuated or inflated estimates of influence unless this bias is taken into account. Complicating any analysis is the fact that some variables will be categorical, like school or curriculum, and these categorical variables themselves may influence or be influenced by other categorical and/or continuous variables.

The substance of these comments is that a truly adequate analytical schema for the study of vocational development must at a minimum allow for:

1. Unmeasured underlying constructs which are defined by a set of specific symptoms.

2. Bias due to error of measurement, both random and non-random, and in both categorical and continuous variables.

Werts participation in the Vocational Development Study was de to these problems. Four papers by Werts which illustrate his progr are included in the Appendix, and a number of other related papers listed in the References. The following are some conclusions from papers:

1. In systems of continuous, infallible variables, the severa procedures (e.g., partial correlations, regression weights, part correlations) now in use to measure the influence of one variable o another are not interchangeable, but involve different substantive assumptions about the process under study. (Werts and Linn, 1969; Linn and Werts, 1969).

2. Errors of measurement, both random and correlated may be incorporated into an analysis including nominal and continuous variables (Werts and Linn, 1970a, 1970b, "Corrections for attenuati <u>Educational and Psychological Measurement</u>, in press, "Classificatio errors in categorical variables," unpublished paper; Linn, Werts, a Joreskog, 1971; also see Appendix B, paper 2); however, the result be an increase in the number of unknown parameters in the analytica model, which must usually be compensated for by including in the analysis multiple independent measures of each underlying variable.

3. For the purpose of estimating the parameters of such compl models, the general model devised by Joreskog ("A general method fo analysis of covariance structures," <u>Biometrika</u>, in press) appears t quite useful. Many problems of translation remain, however (Werts, & Joreskog, "Estimating the parameters of path models involving unmeasured variables," in <u>Causal Models in the Social Sciences</u>, in

4. Perhaps the most important lesson we have learned is that conceptual clarity must precede choice of statistical procedures (Linn and Werts, 1971; Werts, 1970; also see Appendix B, paper 4). Otherwise, there is no basis for deciding which of the numerous ava statistics provides a reasonable simulation of the processes under

Measures

In describing the ideal way to evaluate the effect of a developmental variable we mentioned administering "a broad range of cognitive and noncognitive measures." The Growth Study provided a very adequate battery of cognitive measures, and a source of noncognitive measures in the 177-item Background and Experience Questionnaire. Since this was given to the 7th graders in 1963, the 9th graders in 1965, and the 11th graders in 1967, it offered the possibility of repeated measurement of interests, plans, school and nonschool activities, and values, either by using single items from the questionnaire or by constructing scales from two or more items. Initial consideration of this possibility of repeated measurement raised a serious question, however: when changes are observed from one administration to the next, is it because the student or students have changed or because the meaning of the scale has changed?

Consider, for example, a scale measuring interest in mechanical things (go-carts, hot-rods, motorcycles, etc.). At the 7th grade level this may reflect a precocious interest in mechanical engineering, at the 9th grade level a typical masculine hobby, and at the 11th grade level a rejection of conventional academic pursuits.

Freeberg and Rock's study of factorial invariance in the BEQ was designed to investigate this question of changing meaning. In their study, reported in the Appendix, they also examined the question of whether questionnaire data from cross-sectional samples would lead one to the same conclusions about structural changes in the responses as would longitudinal data. Freeberg and Rock concluded that the choice between cross-sectional and longitudinal data is a critical one, for indeed the factor structures which emerge from the two types of data differ. The analysis of the longitudinal data revealed a change in the factor patterns at the 9th grade level, suggesting a transitional role for the 9th grade. No such change was observed in the corss-sectional data however. Generally speaking, the cross-sectional data had a more stable factor structure than the longitudinal data. The results also served notice on the Vocational Development Study staff that caution had to be exercised in selecting scales from the BEQ; some scales exhibited reasonably stable relationships with other scales over time but others did not.

Substantive Findings

Having summarized some of the methodological conclusions from the study, we will now summarize the substantive findings. (The methodological findings were mentioned first by design--to serve notice on the reader that the substantive findings must be accepted with caution.) Although the data for the various studies were excellent--superior to those of most comparable studies--and the analyses were carefully done by the best available techniques, there is little which can be concluded with certainty.

The Growth of Negro and White Students

Consider, for example, the comparison of Negro and white students described in Chapter 8. Examination of the mean scores for the two groups at grades 5, 7, 9, and 11 showed the following:

1) At the 5th grade level there is a substantial gap between the achievement of white and black students.

2) The 5th grade gap was greatest in STEP Reading and STEP Listening (measured ability to understand the spoken language).

3) On some tests the gap continued to widen thereafter.

4) On other tests the black students exhibited growth which paralleled that of the white students, even though they started out, at the 5th grade level, one or two years behind the white students. (What if they had started out equal?)

How do you explain the observed differences? The students lived in the same cities, so the results do not reflect regional differences. The students attended the same integrated high schools so, at the high school level, they shared the same physical facilities. But does this mean they took the same courses? A first check on this showed that three times as many white students were enrolled in academic (college preparatory) programs as in non-academic programs, but only one-half as many black students were enrolled in academic programs as in non-academic programs. Knowing that students in non-academic programs achieve less well on the STEP tests than students in academic programs--even when adjustments are made to reflect the fact that academic students are generally more able academically--we compared the achievement of the students <u>within</u> curriculum groups.

The results indicated that:

1) Within a curriculum the white students exhibited higher achievement than the black students.

2) The pattern of growth scores for STEP Listening was different from the pattern for STEP Reading.

3) For both tests, the pattern for "Town A" was different from "Town B." (In "Town A," the STEP Listening scores of the four groups converge, whereas in "Town B" they diverge. In "Town A" STEP Reading scores of the Negro Academics grew at a higher rate than those of the White Non-Academics, whereas in "Town B" the scores coincided.

In conclusion, how the black students fared over the years was in some way related to the city in which they lived, the curriculum in which they enrolled, and the domain of achievement which was in question. By and large, they achieved lower scores than the white students. In further pursuit of possible reasons, we examined the home background of the students, in view of the extensive evidence that it is importantly related to school achievement.

Home background was studied by means of the Background and Experience Questionnaire (BEQ). Examination of the occupation and education of the students' parents indicated the following:

1) Generally the parents of the white students completed more years of school and were in higher level occupations, although the differences were not as marked as one might expect, probably because both the black and white students lived in the same school districts.

2) The white students in non-academic programs had approximately the same mean SES scores as the black students in academic programs. (SES was measured by Hollingshead's two factor method.)

Recalling that the achievement of white students in non-academic programs was approximately equal to the achievement of black students in academic programs, we wondered whether the study was a study of racial differences or of socioeconomic status (SES) differences. If statistical adjustments were made to equate the groups as far as SES was concerned, would achievement differences remain? Efforts to make such adjustments foundered, however, when further analysis of the SES-achievement relationship indicated that it differed for the two racial groups in ways which were difficult to explain. To ke appropriate statistical adjustments requires a clear conception of the psychological and sociological processes underlying the observed data. At this stage in the development of educational psychology we do not have such a conceptual model. A major conclusion of this program of research was that the development of a conceptual model of academic growth should receive top priority in future research.

We regard the Negro-white study as a contribution, since it provided a description of the mean growth of the two groups, based on longitudinal data as opposed to the usual cross-sectional data such as that in the well-known Coleman Report. We can demonstrate that, except under rearely met conditions, cross-sectional data provide misleading estimates of student growth (Hilton & Patrick, 1970). In addition, the study took into account high school attended, curriculum, and sex, and examined SES differences among the groups. Differences between the racial groups were found despite the controls. But the definite possibility remains that the differences were attributable to family background. Thus as descriptive findings the results are useful, but as explanations they are inconclusive. Left out of the design--because we could not include everything in a first analysis of the data were some possibly critical variables:

1) the subjects studied by each student (Controlling on curriculum is a poor substitute for this.)

2) non-school opportunity and incentives for intellectual development

3) vocational and educational aspirations

4) peer group pressures

5) school social systems variables (e.g., number, status, and role of black staff members)

6) self-esteem.

This list is incomplete but it serves our present purposes. The point is that, because of the methodological problems mentioned earlier combined with the complex interactive nature of student achievement, it is difficult to draw unequivocal conclusions even from carefully designed multivariate studies. The descriptive results should not be underestimated, however. The achievement of black students was significantly below that of the white students even when steps were taken to hold constant certain conditions (school district, high school attended and curriculum). The mean differences represent facts of substantial educational significance.

Curriculum Differences in the American High School

An early effort of the Study was to obtain some purely descriptive data on various curriculum programs in U. S. high schools. Are there significantly different programs in the high schools? What differences seem to result from enrollment in one rather than another?

In brief, the study concluded that there were significantly different programs, i.e., programs which differed in more than name, but that the similarities among them were more striking than the differences. In some schools, especially in the West, the separate curriculum as a school organizational structure seemed to be disappearing. Many students, as late as the eleventh grade, were not sure what curriculum or program of study they were in. Nevertheless, in the total sample 50% classified themselves as being in the academic or college preparatory program, 17% in business or commercial, 13% in general, 9% in vocational, and the balance in agriculture (1%) other (2%) or were undecided (4%).

As for what difference it makes to be in a particular program, the descriptive results provided a few insights and some hypotheses which were pursued in subsequent studies. It was clear, for example, that curriculum was by no means as infallible predictor of post-high school plans. Most of the "academic" students (87%) planned to continue their education but 45% of the "non-academic" students also had such plans. Only 29% of the "non-academic" students planned to go directly into work or military service.

The follow-up study (see Chapter 11) was designed in part to investigate what effect curriculum had on post-high school pursuits. The picture obtained is similar to that obtained from the student's plans: high school curriculum is by no means an infallible predictor of post-high school occupation. In fact, none of the three variables examined (academic aptitude, socioeconomic status, and curriculum) was highly related to post-high school educational attainment (e.g., four-year college, two-year college, employment etc.). The zero-order correlations of these measures with educational attainment were .45, .29, and .48 respectively. Of the three, high school curriculum had the largest path coefficient leading to educational attainment, suggesting that its independent effect, i.e., an effect which cannot be accounted for in terms of any of the other variables examined, was greater than that of the other two. In other words, given two students with the same family background and ability, if the first identifies with the academic program and the second with a non-academic program, the chances of the second's not going to college is appreciably increased.

Another finding from the follow-up study is relevant here. For part of the Growth Study sample, both a one-year and a three-year follow-up were conducted. The results showed that almost as many respondents had been in and out of college as had entered directly and progressed without interruption into the third year. The path coefficients mentioned above were essentially similar for the one-year and the three-year college attendance groups. But other results could differ appreciably, depending on how college attendance is defined.

The mean differences in test performance among the curriculum programs were dramatic. At grade 11, for example, approximately four years of achievement in mathematics separated the college preparatory students from the vocational, home economics, and business students. In other words, by grade 11 these "non-academic" students had achieved, on the average, a level of sophistication in mathematics which the average academic student had achieved in grade 7. To some extent this is an irrelevant comparison, for many of the "non-academic" students never enrolled in algebra and geometry and thus were handicapped in taking the grade 11 STEP Mathematics test. But the difference is almost as great in STEP Reading, which is primarily a measure of reading comprehension, and also in STEP Social Studies. The real question, however, as far as this research was concerned, was whether the difference in achievement resulted from enrollment in a particular curriculum.

Causes of Observed Differences Among Curriculum Groups

The answer to the above question is, as with most questions in this area, complicated. As a first step in the investigation, the earlier test scores of the 11th graders were examined. (See Chapter 5.) This showed that as early as grade 5 (the youngest Growth Study sample) the differences in test scores between students who later entered academic and various non-academic programs were of approximately the same magnitude as at the grade 11 level. If the mean scores of each curriculum group are plotted, the trend lines connecting the means approximate either straight lines or smooth curves with slightly decelerating slopes.

From one point of view, the trend lines indicate that the curriculum in which the students enrolled had no effect on their developing academic skills. This point of view holds that if a treatment or experience has an effect there will be an observable change in the rate of individual growth. Each group of students serves as its own control.

This approach assumes that in the absence of a new and different experience the student will continue to grow at the same rate as he has in the past. An alternative model is analysis of covariance, in which each group's gain in the course of some treatment or experience is adjusted in terms of its initial position on one or more variables which are related to the outcome measure in question. In effect, each group is evaluated in terms of how well it does relative to what we would predict, knowing its position on a number of scales related to the achievement scale in question. This is in contrast to the previous approach, where the group is evaluated relative to its own past mean scores on the scale in question.

Chapter 6 described an approach to the curriculum effect question from the analysis of covariance point of view. In that study the students were grouped not only by curriculum but also by sex and high school attended. Achievement was adjusted in terms of previous achievement on the STEP and SCAT and--in a sub-study--in terms of the socioeconomic status of each student's parents. The results indicated that curriculum did make a difference: the academic students did significantly better than would be predicted, and at some schools the differences were significantly greater than at others. The vocational students did well in STEP Science relative to the other non-academic groups.

Do Schools Differ?

Other results concerned the question of school differences: Do schools differ when "input" differences (e.g., ability) are taken into consideration? The answer here was clearly yes.

Generally it was the high status schools, i.e., the schools with students from families of relatively high socioeconomic status, which exhibited higher mean achievement, but on some dimensions--especially at the 11th grade level--the lower SES schools emerged with high scores when adjustments were made for differences which existed among the schools at previous grade levels. Thus, as far as unadjusted scores were concerned, the high-SES schools had consistently higher mean scores, but this was not consistently the case with the adjusted scores.

If we accept the adjusted scores as a measure of growth, then the implication is that on certain dimensions students in low-SES schools exhibited a higher rate of growth than students in high-SES schools. The explanation is not obvious. Is there perhaps a practical ceiling on rowth imposed either by the testing instruments or by the nature of tne instructional program in the schools? Does such a ceiling prevent the students in the high-SES schools from fully demonstrating their achievement? Or is it that the students in low-SES schools begin high school at a much lower level of achievement than the students in high SES schools and consequently have more room for growth? Perhaps it is easier for a school to influence large gains in achievement when its students are below the national average in achievement than when its students are already "pushing the top" in achievement.

A check on the distribution of 11th grade scores provided no evidence of a "pile-up" at the high end of the scale, but this does not preclude the possibility that the high-achieving students had acquired skills and knowledge which they were not given an opportunity to demonstrate on the tests. Or perhaps there is not a linear relation between scale scores and the knowledge gained by the students. Obviously these questions, which have a critical bearing on school evaluation, sorely need further research.

To discover further explanations for differences in achievement among schools, field trips were made to each of the Growth Study schools. Chapter 7 summarized the staffs' observations and speculations concerning three of the schools visited. The main impression gained was that the community does have an important impact on the school. "A school in a community where the parents are not truly concerned with education will find its programs, however well-conceived, less effective than they might otherwise be."

The Problem of Dropouts

Also important, as an outcome of the field studies, were certain methodological observations, particularly one concerning dropouts. It was apparent that the relatively high mean achievement score of one of the school systems resulted from a relatively high loss of low ability students from the school. Furthermore, the high loss appeared to result, in part, from the absence of a differentiated high school curriculum and adequate guidance services. It is ironic that providing a school program and school facilities that influence marginal students to remain in school can result in a school's not comparing well with other schools when the bases for comparison are the mean scores of the students enrolled in the school.

Obviously, any comparison of schools must consider both the mean scores of enrolled students <u>and</u> the school's success in holding low ability students in school, assuming that the latter is a desired educational outcome. It is also obvious that any evaluation of the role of curriculum programs must take into consideration their contribution to the school's holding power. The staff repeatedly got the impression that "early school leaving" would have been more prevalent than it was if the non-academic programs had not offered an interesting and challenging alternative to many students who were frustrated by the college preparatory curriculum.

Whether in fact it is wise to try to hold low ability students in school is an unanswered question. Presumably it is, but it is conceivable that a cost-benefit analysis might demonstrate that marginal students learn too little in school to justify the educational costs incurred by the community and the on-the-job experience and income lost by the student--yet another important question needing further research.

The field studies suggested that between-school differences in dropping-out rates may be explainable as an interaction between employment opportunities in the community and the efforts of the school to provide an educational program and guidance facilities which meet the needs of marginal students. The increased range of subject matter and skill training open to the students may be a critical strength of a varied school curriculum, i.e., a curriculum which offers a broad range of fully supported programs as opposed to one that offers primarily a college preparatory course and secondarily a smattering of vocational courses. The variation in the curriculum can also be in terms of the setting of the instruction; it can take place both in the classroom and in commercial or industrial situations in the form of supervised work experience. Thus it is hypothesized that curriculum variation contributes to school holding power. Whether or not the hypothesis holds in general should be examined in a larger study than the field study described in Chapter 7.

Which students drop out within a particular school was investigated in a separate study (described in Chapter 9). Of the predictors examined, age in the fifth grade was the best; older students were more likely to drop out later on. Presumably this is because the older students at the fifth grade level are the students who already have a history of failure, of having been held back. But perhaps they merely started school later than the average. These are quite different possibilities, with important implications for educational practice, which should be investigated further.

Surprisingly, no evidence was found in the drop-out study to support the hypothesis that data relating to a student's academic growth from fifth to seventh grade would significantly enhance the prediction. We had expected that trend, i.e., improving or losing ground relative to others, would predict early school leaving better than a score obtained at one particular time.

The Function of Curricula

As mentioned above, within-school mean differences in growth were consistently found among the curriculum groups. But, although statistically significant, they were small in magnitude compared to the differences which existed among the groups at the grade 5 level. A possible interpretation is that the U. S. high school curriculum is not so much a teaching device as a selection device, or--in the language of Chapter 5--a student-sorting device. From this point of view, the conventional high school curriculum structure is primarily a way of accommodating differing levels of student proficiency. Only secondarily is the typical high school curriculum structure a way of "preparing students for life," as curriculum planners are fond of saying.

Whether or not the sorting function provided by the curriculum structure is good educationally is an exceedingly complex question, about which we can only speculate. To our knowledge, no high school ever tried randomly assigning students to curriculum programs, and we doubt if any school ever will. We are left, therefore, with post hoc analyses in which we try by various means to estimate what would have happened if they had been randomly assigned. The analyses of covariance which were conducted suggest that as far as conventional measures of academic ability and achievement are concerned, the results are about as one would expect: the college preparatory programs enhance the students' test performance relative to the other curriculum programs. On the other hand, visual examination of the growth trend lines suggests that specific high school curriculum programs have very little differential impact on the developing abilities of the students. Our intuition, however, suggests a third view: that if students were assigned to programs at random, more students than now would find their academic work a source of either boredom or frustration. The assumption here is that the various curriculum groups serve as ability groupings--as one way of accommodating differing levels of student ability. While we cannot claim to have confirmed this view, we know of no data which are inconsistent with it. For example, the continued growth of the academic students from grade 9 to grade 11 can be interpreted as meaning that enrollment in the academic curriculum allowed certain students of above average ability to continue to grow intellectually in that time period.

Also it must be kept in mind that the results discussed are largely from conventional measures of academic ability. Future research with measures more fully representing the goals of the non-academic programs should add important additional insights.

The program of research described in this report was not conceived as an effort to answer immediate operational questions. It was, rather, conceived as a basic research study with the primary objective of describing student growth in such a way that the description might some day--now or in the future--be useful to other researchers and educators. It would be disappointing, however, if the effort did not have at least a few implications which could be enumerated at this point.

Implications for Research

1. As mentioned repeatedly in the previous pages, the choice of a statistical model usually is uncertain because we do not have a clear conception of the psychological processes in question. The obvious implication is that development of theories of individual educational and vocational development must be given top priority in allocating research resources in the future.

The theories in question obviously will be multivariate and will draw on a broad range of disciplines, e.g., sociology, social anthropology, learning theory, role theory, and organizational theory. The last named theory is suggested by the observation that the administrative structure of the school, including rules, procedures and policy, has an important effect on which subjects a student takes and this in turn influences his educational and occupational plans.

2. High priority should also be assigned to the development of valid measures of key variables, especially the following:

a) Attainment other than conventional subject matter achievement. Some examples are appreciation of literature, respect for craftsmanship, self-understanding, vocational skills (e.g., office procedures, nutrition, electronics) human relations skills, vocational maturity and vocational adjustment (or some more operational redefinition of the terms), personal work values.

b) Environmental pressures. Some examples are community attitude towards education, educational incentives in the home, school intellectual climate, equality of educational opportunity within the school.

c) Educational process variable. Some examples are amount of positive classroom reinforcement, time devoted to study of various subjects, relevance of subject matter to student's goals.

3. Generally speaking, the students in affluent communities exhibited more rapid academic growth than the students in less favored communities. But this was not uniformly so on all dimensions of achievement or in all time periods. The exceptions suggest a profitable direction for future research.

4. Comparisons among schools cannot be based solely on mean academic achievement of students enrolled at one point in time. Even growth measures are not sufficient, although for most purposes they are an improvement over status measures. What must also be considered is the holding power of the school, for some schools may have achieved high mean scores through the dropping out of a relatively high proportion of their low-ability students. It is also true that comparisons must be based on a comprehensive set of criterion measures, including measures of the nature described in 2a above.

5. The functioning of a school cannot be understood in isolation from the community it serves. The kind of support it receives and the pressures and problems it encounters must be considered in evaluating its success or failure.

6. The black students in academic programs in one of two city systems studied showed relatively accelerated growth rates in comparison to the academic black students in the other city system. Why such growth rates vary from system to system needs further investigations.

7. The staff's effort to develop an interview schedule (see Appendix) demonstrated once again the subtlety and complexity of individual career planning. The effort raised a question with interesting research implications, namely, whether it was possible to study in depth the career decision-making of an individual without at the same time influencing that career decision-making. While the investigators were not discouraged by this observation--in fact the self-discovery experienced by the subjects was a valuable outcome in itself--they did decide that in future research they would experiment with other procedures, including the further development and administration of a role playing exercise, as an alternative way of getting at vocational decision-making styles and vocational maturity.

Implications for Educational Practice

1. The first implication for educational practice concerns the large discrepancy in achievement between the academic and the non-academic students. (On the STEP and SCAT scales three or four years in achievement separated the two groups.) Several possible reasons for the discrepancy were noted, the main one being that lower ability students tend not to elect, or to be assigned to, the college preparatory subjects. Regardless of the reason, however, Is the discrepancy tolerable? Is it acceptable for half of U. S. eleventh graders to be three or four years behind the other half?

One consideration is just how low by absolute standards is the mean performance of the non-academic students. This could be ascertained by examining the test results on an item by item basis. What percentage of the non-academic students got each item correct? Then by examining the content of the item a judgment could be made about the educational significance of the students' success or failure on that particular item. We will not even speculate about who should make this judgment.

2. In the exploratory study of student curriculum decision-making which was described in the Interim Report and has been published elsewhere (Halpern & Norris, 1968) it was concluded that students in making decisions pay primary attention to their abilities. Results of this study are consistent with conclusions by staff members derived from observing the process by which students either chose or were assigned to subjects at the high school level. Here also the major consideration seemed to be either a student or guidance counselor's perception of the student's ability. Furthermore the student's ability estimate seemed to be derived primarily from the letter grade he received from his teachers as opposed to test scores. Whether or not this is a valid and efficient way for the student to make decisions is not at issue here. The implication for educational practice is that teachers' grades do have a significant indirect effect, namely, the effect on student decision-making, and this being the case every effort should be made to make the grades as valid as possible and to supplement them with other measures of his ability and achievement. High school staff members may want to examine their own practices and policies to see what role teachers' grades and test scores play in their school and, having ascertained this, to ask themselves whether what they find is consistent with their educational philosophy and goals.

3. The preceding remarks accept the influence of ability on career development as a given. But surely this should be questioned. Practically all theoretical models of career development emphasize non-cognitive variables such as interests, and preference values (Hilton, 1962). Evidently there is a discrepancy between the way theoreticians think students <u>should</u> make decisions and the way they do make decisions, assuming that the observations of the present research staff are valid. If it is agreed that the discrepancy is unacceptable then some kind of remedial steps are required. One step would be the systematic training in career decision-making for adolescents which has been frequently proposed. (See, for example, Katz, 1966.)

4. The non-college students reported less liking, less anticipated utility and, most important, less growth in the traditional academic subject matter. They also reported more interest in their vocational courses than the academic students expressed in their college preparatory courses. This suggests a re-evaluation of the format of traditional courses. But the need for mobility mentioned above must be kept in mind. Taking business arithmetic, for example, should not militate against a student's subsequently switching to college-preparatory mathematics.

5. Judging from the field studies, the most effective way of holding students in the school may be cooperative educational programs which give students work experience in the community as well as in the school.

6. The general picture of Negro-white differences in achievement was one of a substantial gap at the fifth grade level which increased steadily thereafter. But on approximately half of the instruments, the more "content oriented" tests, the gap increased by no more than we would predict on the basis of the initial differences between the groups. The implication is that if somehow the gap could be closed at the grade 5 level, the black students' subsequent growth on these tests would equal that of the white students. This suggests a concentration of instructional aid to black students in elementary school, a step already proposed by a number of educators and researchers.

Concentrating aid at the elementary school level does not mean that aid at the secondary school level would be to no avail. At least there is no evidence to this effect which is known to the present authors. We tend to assume that the longer the remedial work is postponed the greater will be the required effort, but to the best of our knowledge this is an untested assumption.

7. Students with relatively high dropout potential can be identified as early as the fifth grade. Identifying such students then and immediately beginning remedial steps should reduce later dropouts.

8. The weak relationship between high school curriculum programs and post-high-school occupation clearly suggests a reconsideration of conventional curriculum structure. Is the sorting function that curricula now perform consistent with our educational values and objectives? This is not to say that separate programs necessarily should be abandoned. What is required is a reevaluation of the purposes they serve in the light of follow-up studies of high school graduates such as the follow-up conducted here. Alternative ways of grouping students may better serve our objectives. Students might be grouped according to their preferred mode of instruction, abstract and theoretical versus concrete and practical, for example. This is, in effect, what present curriculum structure does, but why refer to one program as college preparatory and the others as non-academic or vocational when, in fact, the implied function is not that clear, and perhaps not even justified.

Factorial Invariance of a Biographical Inventory for Adolescents: A Comparison of Longitudinal and Cross-Sectional Results

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Abstract

Several indices of factorial consistency were applied to a biographical inventory administered to a longitudinal sample ˜ 2070 students in the 7th, 9th and 11th grades. Results were compared with those of a prior cross-sectional study at the same grade levels. Comparisons of dimensional change over the three grades, for the cross-sectional and longitudinal sample, showed general similarities in the number of major factors extracted, their designations and the variance accounted for. However, there were marked differences between the samples in their factor intercorrelations and the developmental changes shown in factor "presence." A transition effect associated with the factor pattern of the 9th grade was found only in the longitudinal sample. The importance of identifying the extent of factorial invariance for measures used in studying patterns of behavioral development is discussed.

Factorial Invariance of a Biographical Inventory for Adolescents: A Comparison of Longitudinal and Cross-Sectional Results

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Attempts to identify behavioral change at different age levels have forced psychologists to deal with problems of structural consistency in the measures applied. Wohlwill's (1970) argument for incorporation of the "age variable" as a dependent one in developmental research stresses a need to uncover broad sets of behaviors that transcend the "situation-bound measures--better suited to the needs of the experimentalist" (Wohlwill, 1970, p. 56). This goal of defining continuity of response patterns has, in turn, stimulated efforts to identify scales that are reasonably stable with respect to interpretation of their dimensionality over some defined developmental period.

Emmerich (1964, 1968) summarizes several approaches to defining consistency of emerging response patterns along with analytical techniques that have been applied in testing (and reconciling) the differing views. Factor-analytic procedures often are employed to demonstrate (a) similarities in factor designations or loading patterns, (b) intercorrelations among factors, and (c) agreement in the number of factors extracted and in the variance accounted for. Relatively few studies with young children or adolescents have applied factor-related indices to determine developmental changes on noncognitive measures (Black, 1965; Bronson, 1966; Emmerich, 1964), and these few have been based primarily on observer ratings of personality variables, relatively small samples in relation to the number of variables measured, and use of differing statistical methods for defining the extent of dimensional similarity. The variety of indices that have been utilized can be variable in interpretation [at times, admittedly difficult to interpret (Black, 1969)] and also serve to limit comparison of findings with similar samples across different studies.

More comprehensive and interpretable sets of indices are available from a recently developed technique (Meredith, 1964) that summarizes multidimensional stability and continuity over more than two points in time. (As utilized in this paper the term "stability" refers to the relative invariance of the patterns of correlations among factors across occasions, whereas the term "continuity" may refer either to the overall similarity of factor loading matrices on each occasion, to the average factor loading matrix or to the presence, or absence, of some particular factor on one or more occasions.) The advantages of Meredith's method become apparent when direct dimensional comparisons are to be made with the same measures applied to different individuals cross-sectionally or when a contrast is desired between cross-sectional and longitudinal samples.

Using the Meredith procedure, Rock and Freeberg (1969) examined factorial invariance for a biographical inventory administered to a cross-sectional sample of over 12,000 students in the 7th, 9th and 11th grades. That analysis based on a modification of Meredith's technique, served to define biographical factors that are relatively invariant over several grade levels, to determine the relative presence of the factors over time, and to determine the extent of change in the stability of factor intercorrelations--i.e., whether the covariances between factor axes remain comparable over time. Results permitted identification of factored scales that tended to retain their consistency of interpretation (e.g., scales defining conventional masculine-feminine activities; various leisure time activities) and of factors that showed changes which cast doubt on their common "meaning" at different grade levels (e.g., academic, literary and social activity factors).

The present study deals with the application of the same analytical method to a longitudinal sample drawn from essentially the same student population utilizing item scores from the same biographical instrument. Thus, it is possible to determine areas of dimensional continuity for a biographical measure when used with a longitudinal sample and, at the same time, to contrast the results with the cross-sectional data previously reported. If extensive differences in factor patterns and stability are shown for the same instrument when used with either study design, then the case is strengthened for cautious application of measures, in any developmental framework, until the nature of those dimensional changes can be identified.

Method

Sample

One thousand fifty-one females and 1019 males who had participated in the Educational Testing Service Growth Study (Hilton & Myers, 1967) constituted the longitudinal sample on which the present analyses were based. Students who were in the 7th grade in 1963, the 9th grade in 1965 and the 11th grade in 1967 completed a biographical information blank designated as the Background and Experience Questionnaire or BEQ (Maier & Anderson, 1964). This 169-item inventory deals with academic and vocational preferences as well as a wide range of recreational and leisure activities. Responses to 124 items, common to the BEQ forms administered in grades 7, 9 and 11 between 1963 and 1967, provided the data for the present study.[2]

The 2070 students in this longitudinal sample consisted only of those for whom complete BEQ data were available from all three occasions. (That is, in addition to completing all items of the inventory, they had not left the school system by virtue of dropping out or moving away and were present in school at the time of the three test sessions.) In addition, it should be noted that there is an overlap, at the 7th grade level, between the present longitudinal sample and the cross-sectional sample with which comparisons are to be made. The overlap is approximately 32% since the 2070 subjects represent a subsample drawn from 6608 who were in grade 7 in the cross-sectional sample of 1963.

Data Analysis

The method developed by Meredith (1964), which, with minor modifications, was applied to the background inventory data used in the study by Rock and Freeberg (1969), is described in detail in the latter paper. Briefly, the method is one in which a single factor pattern matrix ("average matrix") is computed for purposes of describing the regression of observed scores on factor scores in different subpopulations. This average matrix represents the basic innovation of Meredith's technique and may be considered the single best fitting factor-pattern matrix derived from K factor patterns computed on K subpopulations. Specifically, the procedure for determining factors, which are relatively invariant over the three grade levels, involves the following analytical steps: (1) construction of a single average matrix which may be interpreted as the result of factoring the average reproduced covariance matrices; (2) rotation of the average matrix to a simple structure solution for interpretational ease; (3) rotation of the average matrix to similarity to the subpopulation factor matrices; (4) examination of the relative fit of the average matrix on each of the three occasions, and (5) computation of intercorrelations among the factors on each of the three occasions in order to determine the relative stability of those intercorrelations.

In the cross-sectional analyses (Rock & Freeberg, 1969), 11 factors were extracted from each subpopulation (i.e., grade level) matrix, based primarily on an a priori decision to extract one more dimension than the 10 originally hypothesized by the authors in their design of the BEQ (Maier & Anderson, 1964). Since 11 factors were adequate for defining the dominant dimensions of the measure, and because of the present study intention of contrasting the cross-sectional and longitudinal findings, 11 factors were extracted and retained.

Indices available from the above procedure for interpreting the extent of factorial invariance consist of: (1) Scaled factor variance estimates that appear as diagonal elements of variance-covariance matrices of the factors at each grade level. These define similarities in pattern for each factor based upon the extent to which a factor in the average pattern matrix is represented in the subpopulation matrices. Factor "presence" is defined by the pattern of change in these variance estimates over the time period of interest. (If a factor were equally present at each grade level each variance estimate would be 1.00.) (2) The trace value of the "error" matrices premultiplied by their transpose indicates the degree of overall similarity (i.e., goodness of fit) of the average matrix to each subpopulation matrix. (If the average matrix were exactly equal to a given subpopulation matrix the trace value would be zero.) (3) Correlations between factor axes within each subpopulation as an indication of the degree of orthogonality in structure.

Changes in correlations among factors over the three time periods represent the extent of dimensional stability.

Results and Discussion

Results will be considered first for the present longitudinal study (LS) sample, to be followed by comparisons with the previously reported cross-sectional study (CS) results.

Longitudinal Sample

Tables 1, 2 and 3 present the correlation matrices of the average matrix

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Insert Tables 1, 2 and 3 about here

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when rotated to fit each of the individual factor matrices for the 7th, 9th and 11th grades of the LS sample. In Table 4 the scaled factor variance estimates are listed, by factor and grade level, along with trace values for each subpopulation matrix, and below these the proportions of variance accounted for by the factors of the LS sample. The same indices, shown in Table 4, from prior CS study results are intended for use in subsequent CS and LS comparisons.

Insert Table 4 about here

Pattern similarity (specific factor patterns). The 11 factors extracted from the average matrix for the LS sample were readily interpretable and their designations are shown in Table 4.[3] These factors accounted for 31% of the variance in grade 7, 31% in grade 9 and 30% in grade 11. Several large shifts in the size of the scaled variance estimates, for each factor at the different grade levels, reflect marked changes in factor presence and imply some forms of instability in factor patterns over the course of the students' development. These differences center largely on changes at the 9th grade, in comparison to the other two grade levels. Thus, Factor II (Sports and Masculine Interest) is present to about the same extent in grades 7 and 11, but diminishes drastically for grade 9. The same result is apparent for Factor X (General TV Viewing), and Factor VII (Musical Activities, e.g., taking music lessons, going to concerts) also shows distinctly less presence at 9th grade than at either of the other two grades.

By contrast, Factor III, which deals with General Leisure and Social Activities (e.g., attendance at athletic events, movies, going skating, dancing, shopping, engaging in various hobbies), is accounted for almost entirely by the factor variance contribution of grade 9. This also tends to be the case (and logically so) for Factor VIII, designated as Lower-Level Social Activities (e.g., loafing, reading comic books and newspapers, listening to pop music on radio, watching teen-age music and dance programs on TV). The almost complete variance contribution of the 9th grade matrix that is seen for Factor XI (Academic Effort) is based on a factor that is highly specific--being defined by only three items--and is of interest here only as another example of the marked shifts that occurred in the grade 9 pattern.

Such radical changes in factor presence imply a different meaning or "focus of content" for the particular group of item responses that define a factor. Specifically, the changes seen here strongly suggest a transitional phase between ages 12 and 17 in student perceptions, or expressions of these interests and activities. Such a transitional period occurring between preand later adolescence (broadly conceived of as the onset of puberty) has been noted in the literature for a wide variety of attitudes and interests (Douvan & Gold, 1966).

Also of interest are the several changes in the pattern of factor presence that do not reflect the sharp transition at 9th grade. For example, there is an increase in estimated variance for the Feminine-Esthetic factor (Factor I) in the 9th and 11th grades when contrasted with grade 7, while somewhat of a reverse effect occurs for Talk with Others (Factor V) and Academic Course Interests (Factor VI), both of which tend to decline in presence when 7th grade is contrasted with the 9th and 11th grades.

Overall factor similarity. Trace values for the LS sample (Table 4) indicate not only goodness of fit for the average matrix to each of the subpopulation matrices, but, in effect, the degree of overall similarity of the subpopulation matrices to one another. Thus, the 9th grade matrix trace value of 13.06 shows those factor patterns to be least like the average matrix in comparison with the other two grades. In addition, the trace values for the 7th and 11th grade factor patterns (8.51 and 8.71) confirm their greater similarity to one another than to the 9th grade pattern--a result that might have been expected on the basis of the individual factor comparisons previously discussed.

Comparability (stability) of factor intercorrelations. The correlations among the axes (Tables 1, 2 and 3) show relatively greater orthogonality for the 7th and 11th grade occasions, with far more similar patterns of intercorrelations for those grades than is found when they are compared to the 9th grade. Instability over the three grade levels can be seen as attributable to a number of sizable factor intercorrelations found in the 9th grade matrix.

This is evident from an examination of Tables 1 and 3 which show relatively few correlations between factors exceeding .30 for either the 7th or 11th grade matrices. Correlational patterns on those occasions are not only more similar, but the interpretation of the correlations is fairly reasonable. For example, the strongest cluster in both matrices is formed by the intercorrelations of Factors I (Feminine-Esthetic Interest), II (Sports and Masculine Interests) and III (General Social and Leisure Activities), the Sports factor being negatively correlated with the Feminine-Esthetic factor at each of the two grade levels. The next strongest triad in each matrix involves Factors VI (Academic Course Interest), VIII (Lower Level Social Activities) and IX (Hobbies and Technical Interests), with Factors VI and IX negatively correlated with Factor VIII and to a lesser extent with each other. The fact that higher scores on a subscale of lower-level social activities tended to be associated with lower scores on academic course interests, and on technical interests or hobbies, is logical. By comparison, the 9th grade level (Table 2) shows greater obliqueness of structure in the fit of the average matrix. This is seen in the larger intercorrelations between axes which, in turn, make for relatively uninterpretable factor intercorrelations produced by the "forced fit." Thus, the dimensionality of the 9th grade does not appear to be similar to that of the other two occasions so that resulting correlations between dimensions differ considerably in size and sign.

On the basis of the above factor indices and their patterns of change, the picture for this longitudinal sample over grades 7 to 11 is one of several anomalous aspects of factor pattern and stability of factor intercorrelations (discontinuity?). Reasons for this would appear to stem from the students' item-response characteristics on the 9th grade occasion. If changes in pattern and stability of factor relationships may be conceived of as basic changes in either meaning or dimensionality, indiscriminate application and interpretation of the same biographical items and subscales may be questionable during even the relatively narrow developmental period of 12 to 17 years.

Longitudinal vs. Cross-Sectional Comparisons

The LS and CS comparisons considered in this section bear on the practical question of whether CS study results can serve as a reasonable substitute for the more costly and time consuming LS data. They also reflect on changes in dimensional stability for a biographical measure when essentially developmental (age) comparisons are added to the social changes that may have influenced the adolescent culture over some defined time span (in this case between 1963 and 1967). Areas of similarity as well as change are evident in the indices of factorial invariance discussed below.

Specific factor patterns. Similarities in factor designations between the CS and LS samples (Table 4) indicate similarity of item loadings on the dominant factors extracted from the two samples. Differences found in item loadings and associated designations occurred primarily for relatively specific or minor factors. Thus, a High-Level Literary factor is found exclusively in the CS sample and is defined by only four items, while the factor designated as Academic Effort (defined by three test items) emerges exclusively in the LS sample. The only shift on a major factor occurred for the High- and Low-Level TV Viewing factors of the CS data, which was extracted in the LS analysis as a single General TV Viewing factor. (This latter factor, however, was more like the Low-Level TV factor of the CS sample and is therefore matched with it in Table 4.)

Of particular interest in considering the specific factors are the comparative patterns of change over the three grade levels, as shown by the scaled factor variance estimates. Reasonably comparable patterns of change in factor presence for CS and LS data are found for the factors of Feminine-Esthetic Interest, Technical Hobbies and Interests, Talking with Others and Musical Activities. The developmental effects on those dimensions may be said to have some degree of similarity under either CS or LS designs. On the other hand, the pattern of change in factor presence for Sports and Masculine Interest, Social Activities, Reading Interests and Academic Interests differs for CS and LS data.

Overall factor patterns. When LS and CS samples are contrasted on the basis of the trace values, it is apparent that the average matrix is more similar to the subpopulation matrices for the CS data (i.e., trace values of 1.67, 2.67 and 4.04 for the 7th, 9th and 11th grades respectively). The greater disparity between the average matrix and subpopulation matrices for the LS sample (trace values of 8.51, 13.0 and 8.71) suggest surprisingly greater variation in its overall factor patterns. In accounting for such differences in factor pattern similarity one could focus on the effects of repeated administration of the same measure to the same individuals every other year (i.e., error attributable to test-retest reliability). However, if such errors were involved, one would expect the 7th grade factor pattern to be more like the 9th grade than the 11th since the time span is less. Perhaps social changes in the adolescent culture, between 1963 and 1967, had an impact on the structural consistency of interests and activities that exceeded the differences between adolescent groups at different grade levels during the same year (i.e., in 1963). Any speculation is confounded by the inability to separate the effects of those two sources of variance from "true" developmental effects.

Comparisons of the trace values also indicate that the extent and type of similarity between factor patterns of each subpopulation differs for LS and CS data. For the CS sample, the 9th grade factor pattern was most similar to the average pattern matrix, the 7th grade next in similarity and the 11th grade least similar. The LS sample results differ sharply, with dimensional similarities greater for 7th and 11th grades, while the 9th grade matrix was least like the average matrix.

Marked similarity in the proportion of total variance accounted for by the factors at each grade level is evident for the CS and LS samples. The factors uniformly accounted for about a third of the variance in this biographical instrument.

<u>Factor intercorrelations</u>. For the CS sample considerably greater orthogonality of factor structure was evident at each of the three grade levels, correlations between factors rarely having exceeded levels of .13 (Rock & Freeberg, 1969). However, more than a dozen correlations far exceeded that value for the factors of the LS sample subpopulations shown here, with some r's > .60.

In the CS study, the rotated average matrix provided a close fit to all three subpopulation matrices with no sacrifice in orthogonality. Thus, the sample reflected relative stability of dimensionality over the three grade levels under consideration. A comparable level of stability and continuity is lacking for the LS sample, particularly because of the gross departure from an orthogonal structure occurring at the 9th grade occasion. Such differences indicate that the changes in dimensionality in LS data, which do not appear in

CS data, can occur despite similarities in the designations that define the subscales at each developmental level.

Conclusions

This analysis of factorial invariance for a self-report measure of biographical information has dealt with a relatively short, but apparently significant, period of development between early and late adolescence (i.e., between grades 7, 9 and 11). Changes in underlying configurations of responses to items dealing with interests and experiences could be assumed by the relative strength of dimensions that define the same measure at different grade levels and by changes in the factor intercorrelations over time. However, any interpretations regarding dimensional continuity drawn from the above results should not imply stability of level for any given individual response characteristics.[4]

For the longitudinal sample, there were marked changes in factor presence over the three grade levels, centering particularly on the factor pattern of the 9th grade. These transitional changes were evident, primarily, for the more recreational-leisure types of activities (e.g., social activities, sports, TV viewing preferences) and to a lesser degree for the esthetic-artistic, intellectual and technical areas. Comparisons of the total factor pattern of each grade level (as opposed to specific factor pattern comparisons) lend additional support to the importance of the 9th grade as the focus of a transitional phase for this particular developmental time segment. Thus, 7th and 11th grade factor patterns were found to be somewhat more similar to one another than they were to the 9th grade patterns. Further, an analysis of factor stability or consistency, defined by factor axis intercorrelations over the three grade levels, confirms the transitional quality of the dimensions that underlie the 9th grade responses.

Comparisons of cross-sectional and longitudinal findings have represented a perennial area of interest in the choice of measures (and their interpretation) when studying developmental change. For many forms of measurement, longitudinal and cross-sectional data have produced rather diverse, even conflicting, results (Tyler, 1956). Findings obtained with the biographical measure applied here would, similarly, fail to justify the interchangeability of one data source for another, at least where the research intent is to identify the extent and locus of dimensional continuity.

There were similarities between CS and LS findings with regard to the number of major dimensions found, their designations or meaning, and in the total variance that they accounted for on each occasion. However, there was no reasonable hint in the CS analysis of the unique transitional role of 9th grade factor patterns. In addition the relatively stable factor intercorrelations and greater overall similarity of factor patterns across different grade levels found for a CS sample contrast sharply with the findings for the LS data. Biasing influences that could stem from the selection of the LS sample, however, must be considered. For example, family mobility may have operated selectively in the sample of students who remained in the school system over a five-year period. Also chronic absenteeism on a student's likelihood of inclusion over three test sessions, or willingness to complete the biographical measure at each session were, unfortunately, unknown in their influence on the LS sample composition.

Results of the type reported here may have implications for the construction of developmentally meaningful scales beyond simply specifying the extent of dimensional continuity. There is the possibility that, in addition, these results reflect differential response patterns attributable to developmental effects on perceived stimulus (item) quality. In other words, it is suggested that the structural changes derived from patterns of item interrelationships may reflect transformations or changes in perception of item meaning (i.e., respondent interpretations) at different developmental levels. If so, comparable scales may require modified item material in order to tap dimensionally stable sets of attributes at differing developmental periods. Possible sex differences in dimensional patterns and continuity also remain to be explored for greater precision in the application of BIB scales. Strongly sex-linked factors found with the present data suggest the importance of extending these analyses.

Choice of appropriate analytical techniques and the matter of interpreting results remain as difficulties that are likely to be resolved only by continued research applied to a variety of measurement methods and areas of behavior. The present approach does, however, provide a more fruitful alternative for long-term research planning (especially for long-term longitudinal studies than the all too frequent one of choosing measures that may be in vogue at the inception of a study but lose their developmental "relevance" and intended dimensional qualities before data collection is even completed.

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Footnotes

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[2]The prior study of a cross-sectional sample (Rock & Freeberg, 1969) had used 130 items common to the forms available in 1963 for grades 7, 9 and 11. Included in those 130 were the 124 items of the present study. The six noncommon items were scattered through various factored subscales and are considered insignificant in their effects on the structural comparisons to be reported between cross-sectional and longitudinal study data.

[3]For the factor loading pattern of the average matrix order NAPS Document #__________ from ASPS, National Auxiliary Publications Services.

[4]As a possible way of bridging this gap between individual distinctiveness (relative standing) and changes in behavioral content, or dimensional meaning over time, Emmerich's (1964) concept of "developmental transformation" is of interest.

Table 1

Correlations between Factor Axes

(7th Grade)

1	2	3	4	5	6	7	8	9	10	11
1.000	-0.2500	0.6341	-0.0827	0.0691	0.0501	0.0928	-0.0322	0.0490	0.0097	0.0085
		0.4185	-0.0100	-0.0115	0.0719	0.0931	0.0662	0.0862	-0.0587	-0.2235
			0.0376	0.2408	-0.0464	0.0676	0.0367	0.0936	0.0672	-0.0850
				0.0517	0.0601	0.2007	0.1422	0.1629	-0.0164	-0.1200
					-0.0111	-0.0581	0.0456	0.0141	0.0314	-0.1821
						-0.0749	-0.2369	-0.1767	-0.0220	0.0372
							-0.0102	-0.1279	-0.0981	0.0692
								-0.2906	0.1994	-0.5501
									0.0486	0.3107
										0.0531

Table 2

Correlations between Factor Axes

(9th Grade)

1	2	3	4	5	6	7	8	9	10	11
1.000	0.8519	-0.4580	0.2379	-0.0345	-0.1123	-0.0467	-0.1381	0.0600	0.3415	-0.0379
		-0.4779	0.4724	0.0546	-0.2847	-0.2523	-0.1918	-0.1781	0.3970	0.1370
			0.0268	-0.1195	-0.0073	-0.0397	-0.1239	-0.0366	0.0418	0.0087
				-0.2945	0.4228	-0.7779	-0.1531	-0.1546	-0.1757	0.0457
					0.0009	-0.0080	0.0129	-0.1180	-0.2613	0.0729
						0.1369	0.5904	0.5730	-0.2197	-0.0157
							0.1706	0.3303	0.4402	-0.0509
								0.7400	-0.4565	0.1268
									-0.3930	-0.0146
										0.0067

Table 3

Correlations between Factor Axes

(11th Grade)

1	2	3	4	5	6	7	8	9	10	11
1.000	-0.3984	0.6138	-0.1150	-0.0363	0.0564	-0.0425	0.1982	-0.0980	-0.1442	0.2574
		0.3759	-0.2118	-0.0194	0.0947	0.0357	0.0913	0.0229	-0.0483	-0.3087
			-0.0795	-0.0461	0.0946	-0.1484	0.3350	-0.0245	-0.1141	-0.0082
				0.1284	0.2241	0.2315	0.0147	-0.0350	0.0582	-0.0724
					0.0177	0.0707	-0.0653	0.0744	0.0517	-0.1152
						0.0071	-0.3663	-0.2527	0.1157	0.0269
							-0.1367	-0.0839	-0.0282	0.1478
								-0.4865	0.0154	-0.2023
									0.0855	-0.3876
										-0.0946

Table 4

Scaled Factor Variance Estimates, Trace Values and

Total Variance Accounted for at Each Grade Level

(Longitudinal and Cross-Sectional Samples)

		GRADE					
		7th		9th		11th	
	Factor	LS	CS	LS	CS	LS	CS
I	Feminine-Esthetic Interests	.77	.94	1.16	1.05	1.07	1.01
II	Sports and Masculine Interests	1.16	.94	.58	1.05	1.26	1.00
III	General Social and Leisure Activities	.43	.82	2.23	1.08	.34	1.10
IV	Broad Reading Interests	.87	1.05	.68	.98	1.45	.98
V	Talk with Others (about Plans and Interests)	1.29	1.23	.73	.90	.98	.86
VI	Academic Course Interests	1.53	1.18	.74	1.30	.73	.52
VII	Musical Activities	1.17	1.07	.63	.91	1.20	1.02
VIII	Lower-Level Social and Leisure Activities[a]	.87		1.24		.88	
IX	Technical Hobbies and Interests	1.10	.96	.84	1.02	1.06	1.01
X	General TV Viewing	1.35	1.05	.21	1.01	1.44	.94
XI	Academic Effort[a]	.14		2.80		.06	
	High-Level Literary Activities (X)[b]		1.63		1.05		.32
	High-Level TV Viewing (XI)[b]		1.05		1.07		.88
	Trace Values	8.51	1.67	13.06	2.67	8.71	4.04
	Total Variance Accounted for	31%	32%	31%	34%	30%	33%

[a]Factor extracted from LS sample only.

[b]Factor extracted from CS sample only.

DONALD CAMPBELL'S ADVICE APPLIED TO LORD'S PARADOX

Charles E. Werts and Robert L. Linn

Abstract

As Lord has demonstrated, the use of analysis of covariance on nonexperimental data cannot be counted on to make proper allowances for uncontrolled pre-existing differences between groups. In this paper it is suggested that the interpretational problem that Lord raised is not limited to nonexperimental research but is generic to the research process.

DONALD CAMPBELL'S ADVICE APPLIED TO LORD'S PARADOX[1]

Charles E. Werts and Robert L. Linn

Lord (1967) gave the following illustration of a paradox arising from the use of analysis of covariance to interpret data on pre-existing groups. Two statisticians analyzed the same data from an investigation of the effects on students' weight of the diet provided in the university dining halls. These data showed that from the time of arrival in September until the following June neither the mean weight of girls nor that of boys changed, the frequency distributions likewise remaining the same for both. The first statistician concluded that there was "no evidence of any interesting effects of the school diet (or anything else)" on student weight and that there was "no evidence of any differential effect on the two sexes" since neither group showed any systematic change. The second statistician, working independently, decided to do an analysis of covariance. Since he found "that the slope of the regression line of final weight on initial weight" was "essentially the same for the two sexes," he interpreted the highly significant difference between the intercepts as indicating that "the boys showed significantly more gain in weight than the girls when proper allowance" was made for differences in initial weight between the two sexes. Thus the first statistician asserted that there was "no evidence of a differential change between the sexes" whereas the second statistician asserted that there was such an effect, i.e., wherever boys and girls started with the same initial weight that the subgroup of boys would gain more than the subgroup of girls. Lord stated that this "paradox seems to impose a difficult interpretative task on those who wish to make similar studies of preformed groups" since the "conclusions of each statistician are visibly correct." In this paper we will propose that this interpretative problem is not limited to studies of preformed groups but is inherent in the process of all scientific research and in particular that neither statistician had any basis for interpreting his factual findings as relevant to the question posed.[2]

Having recently attended a lecture series on social psychological research by Dr. Campbell, the senior author was struck by the contrast between the approach of both of Lord's statisticians versus the approach advocated by Dr. Campbell. Dr. Campbell repeatedly emphasized the necessity of stating the hypothesis about the phenomena under study so clearly that it would be apparent which, if any, of the available statistics would be appropriate, whereas neither of Lord's statisticians felt it necessary to justify in substantive terms the relevance of the statistical procedure employed. As Ezekiel and Fox (1959) stress, the successful use of statistics requires "careful logical analysis, and the need both for good theoretical knowledge of the field in which the problem lies and for thorough technological knowledge of the elements involved in the particular problem."

In other words, an investigator following Campbell's advice would feel the necessity to probe much deeper into the nature of the influences on students' diet before choosing a statistical procedure <u>irrespective of whether the study were experimental or nonexperimental</u>. A good social psychologist might therefore try to learn <u>why</u> some students gained and others lost. He might, for example, discover that the losers had been skipping dessert and high caloric foods during the school year. Further detective work might uncover the fact that the losers had been told by friends some sex-appropriate variant of: "My, you are awful heavy for a girl! You would be so much more attractive if you reduced!" Furthermore, in taking this advice the fat girls might give their high caloric foods to thin girls, saying: "Do me a favor and eat this ice crea[illegible] You would look so much more attractive to dates if you weren't so skinny!" Given these findings the social psychologist would feel on familiar grounds and would undoubtedly invoke a theory about pressure towards the "norm." Being quantitively oriented (because of Dr. Campbell's influence) he might tentatively express the observed social pressures in the form of an over-simplified model of reality like:

$$Y_{ij} = X_{ij} - b^*(X_{ij} - \overline{X}_j) + e_{ij} \qquad (1)$$

where i = index number for individual boy or girl,

j = 1 for boys, 2 for girls,

Y_{ij} = weight at end of term,

X_{ij} = weight at beginning of term,

e_{ij} = random fluctuation due to implicit factors,

and b^* = an unknown constant.

In this model, the "norm" has been approximated by the sex-appropriate average weight and $b^*(X_{ij} - \overline{X}_j)$ represents the effect on weight of the social pressure towards the norm, this effect being assumed to increase linearly with increases in deviancy, i.e., $(X_{ij} - \overline{X}_j)$. One way of obtaining an empirical estimate of the unknown constant b^* , would be to form a new variable $x_{ij} = X_{ij} - \overline{X}_j$ which along with X_{ij} would be the independent variables in the regression equation with Y_{ij} the dependent variable:

$$Y_{ij} = B_1 X_{ij} + B_2 x_{ij} + e \qquad (2)$$

where B_1 and B_2 are unknown regression weights. It can be shown that since within the two groups the before and after means and variances are equal, $B_1 = 1$ and $B_2 = - b^* = -(1 - r_{XY})$, where r_{XY} is the within-group correlation of initial with final weight. It follows from equation (1) that when a boy and a girl had the same initial weight, the final weight of the boy would be greater than that of the girl by the factor $b^* (\overline{X}_1 - \overline{X}_2)$ which is equal to the difference between the intercepts the second statistician found by ANCOVA.

The first statistician chose without substantive justification to interpret the fact that the means and variances didn't change, the second statistician likewise chose to interpret the fact that the Y intercepts of the within-group regression lines were different; whereas the social psychologist considered relevant the fact that within a group the mean weight of those who were initially deviant would later be closer to the mean. Of the innumerable statistical manipulations that may be performed, it is necessary to have some guiding theory or empirical knowledge in order to eliminate those procedures which are not relevant to the phenomena under study. Applications of various statistics may yield many findings about the data which the true explanation cannot contradict, but the real problem is to discover the relevance of these findings to the question being asked. Knowing the details about a body of data is nonetheless useful to help eliminate causal explanations which are not consistent with the data, but even then numerous possibilities will remain.

In real research the design problem is to permit elimination of the rival plausible alternative explanations for observed associations among variables. For example, it can be shown that since $b^* = 1 - r_{XY}$, equation (1) may be transformed into:

$$Y_{ij} = \bar{\bar{X}}_j + r_{XY} (X - \bar{X}_j) + e_{ij} \quad . \tag{3}$$

Equation (3) is the equation for any within-group regression towards the mean and indicates that equation (1) would fit many different bodies of data. While many researchers would be inclined to dismiss as "regression artifact" interpretation based on equation (3) and therefore (1), the result of this dismissal might be discarding an important class of effects like social pressures towards the "norm." In a given situation the problem is to decide which alternatives are reasonable and then to gather data which will decide among them. For example, suppose that Lord's paradox had been illustrated using fallible test scores. In this case even though observations by the social psychologist indicated social pressures within groups towards the group "norm," i.e., pressures for high achievers to stop competing so hard and for low achievers to do better, the counter-argument that the regression results were merely due to the unreliability of test scores could not be ruled out. Given these alternatives the study must include data on reliability. One design would be to have two parallel tests X and X' given at time 1 and again at time 2. Given no change in means or standard deviations, this design would suggest that within groups, if the true test score (T_1) at time 1 were perfectly correlated with the true test score (T_2) at time 2, then the "unreliability" explanation is the most plausible. Taking into consideration the possibility of form specific lasting test factors, a heuristic diagram (Figure 1) may be drawn.

Insert Figure 1 about here

It can be seen from Figure 1 that the cross-lagged correlations, i.e., $r_{12'}$ and $r_{21'}$, are not affected by the test specific factors and should only differ to the degree the two tests are not completely equivalent. Since $r_{11'}$ and $r_{22'}$ are the respective reliabilities at times 1 and 2, according to classical test theory the respective true scores will be correlated with observed test scores $\sqrt{r_{11'}}$ and $\sqrt{r_{22'}}$ respectively. It follows that the cross-lagged correlations should equal $\sqrt{r_{11'}}$ times $\sqrt{r_{22'}}$ if unreliability is the total explanation. If the true scores themselves "regress" because of the social pressures towards the "norm," then the correlation of the true scores will be equal to $(r_{12'}) \div (\sqrt{r_{11'}}\sqrt{r_{22'}})$ or $(r_{21'}) \div (\sqrt{r_{11'}}\sqrt{r_{22'}})$. If the true scores are correlated ($r_{TT'}$) less than unity, then the theory about social pressures is still viable and $(1 - r_{TT'})$ will equal the constant b* in equation (1). Even if his theory survives this test, the social psychologist would feel the necessity to measure "social pressure" and "norms" more directly and show that they do in fact have the postulated relationships to weight. If other influences besides social pressure towards the norm are found to be operating, then they must be stated as specific alternate hypotheses and the appropriate data collected to test them. As Blalock (1964) emphasizes: "no matter how elaborate the design, certain simplifying assumptions must always be made. In particular, we must at some point assume that the effects of confounding factors are negligible. Randomization helps to rule out some of such variables, but the plausibility of this particular kind of assumption is always a question of degree. We wish to underscore this fact in order to stress the underlying similarity between the logic of making causal inferences on the basis of experimental and nonexperimental designs."

Summary

From our point of view the two statisticians in Lord's paradox should have been content merely to present their findings about the data--any interpretation thereof in terms of cause and effect being unwarranted in the absence of extensive knowledge about the nature of the phenomena under study. As we have demonstrated, it is quite possible that the particular facts discovered by the statisticians do not shed light on the true explanation, except perhaps in the sense that the true explanation will also be consistent with the data. Whether employed in experimental or nonexperimental studies, the statistical measures employed will be relevant only insofar as the mathematical model underlying them is a reasonable approximation to the nature of the effect being studied. Even if we knew beforehand that the effect results in a change in the mean and that treatments were assigned randomly to groups, it does not necessarily follow that the real world functions according to the ANCOVA model. The usefulness of any statistical application can only be judged in terms of the scientific progress that ensues therefrom, not in terms of whether there is or is not a "treatment effect," since any interpretation of statistics is based on a host of untested assumptions about the way things "really" work.

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Footnotes

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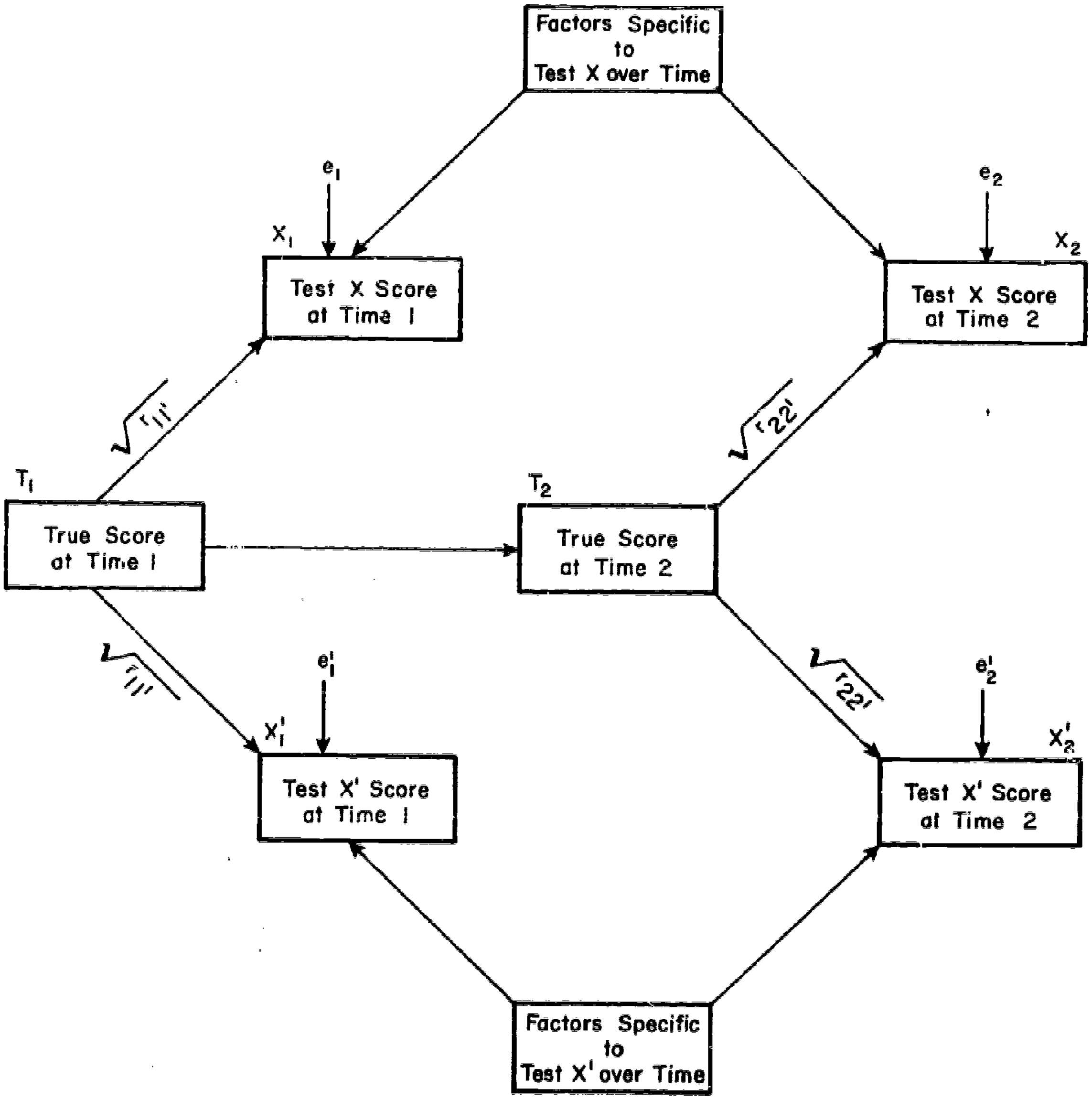
[2]We believe that Lord's example should have used two "psychological researchers" instead of "statisticians" because Lord's paradox isn't really in the statistician's domain but results from the vagueness of the questions set by the researcher. Although inappropriate, the label "statistician" has been retained to be consistent with the original example.

Figure Caption

Fig. 1. Research design to rule out the alternative hypothesis that observed regression effect is due to errors of measurement.

Note.--Tests X and X' are parallel forms which means that $r_{11'}$ is the reliability at time 1 and $r_{22'}$ is the reliability at time 2. If random errors of measurement are the only factor operating, then the correlation of the true scores $r_{TT'}$ will approximate unity, i.e., all observed correlations will be explainable in terms of the reliabilities and test specific factors.


Factors Specific to Test X over Time
e_1
X_1
Test X Score at Time 1
e_2
X_2
Test X Score at Time 2
$\sqrt{r_{11'}}$
$\sqrt{r_{22'}}$
T_1
True Score at Time 1
T_2
True Score at Time 2
$\sqrt{r_{11'}}$
$\sqrt{r_{22'}}$
e_1'
X_1'
Test X' Score at Time 1
e_2'
X_2'
Test X' Score at Time 2
Factors Specific to Test X' over Time

ANALYZING SCHOOL EFFECTS: ANCOVA WITH A FALLIBLE COVARIATE

Charles E. Werts and Robert L. Linn

Abstract

The analysis of covariance method has been employed as a means of controlling for input when studying the differential impact of schools on students. The interpretation of such results is confounded by unreliability in the input measures which may result in spurious findings because in effect input has not been completely controlled. Some of the logical and statistical problems in dealing with covariate unreliability are discussed.

ANALYZING SCHOOL EFFECTS: ANCOVA WITH A FALLIBLE COVARIATE[1]

Charles E. Werts and Robert L. Linn

The analysis of variance, covariance method (ANCOVA) has been employed in nonexperimental school effects studies to control for differential input when studying the differential impact of schools as a categorical treatment factor on some output variable. One of the numerous hazards (Smith, 1957) to interpreting these ANCOVA findings results from the use of input measures known to have considerable errors of measurement. As a consequence, input may not be completely controlled, i.e., the "adjusted" treatment variance which is labeled the "differential" school effect may to an unknown degree still reflect differential input. While no general cure for this problem is currently available, it is worth considering what use might be made of reliability estimates and in what circumstance corrections for unreliability would not decrease the estimated differential school effect.

Rationale for the Use of ANCOVA

It is unfortunately the case that many school effects researchers have used ANCOVA without any substantive justification other than the statement that input should be controlled. It is the case, however, that underlying ANCOVA is a mathematical model, which casts the data in a framework that will be meaningful only to the degree that the phenomenon being studied actually behaves like this model. To illustrate this problem consider a case in which there is one input variable X and an output variable Y. The model for ANCOVA is

$$Y_{ij} = A_j + B_w X_{ij} + e_{ij} \quad , \tag{1}$$

where A_j = the Y intercept of the regression line for school j ,

B_w = pooled least squared estimate of the within-school regression slope,

and e_{ij} = random fluctuations due to unmeasured factors.

Insert Figure 1 about here

As illustrated in Figure 1, equation (1) when applied to school effects research asserts that the slope of the within-school regression lines are all equal. Theoretically this means that a student entering school #1 will on the average gain $A_1 - A_2$ more units of output than a student entering school #2, regardless of whether his input score is initially high or low. Thus the ordering of the intercepts indicates the ordering (in output units) of the schools in terms of effectiveness, regardless of whether the most effective schools get the students with the highest input scores or not (i.e., whether treatment effects are correlated with the covariate). For any given school the additive constant is the same for everyone; in that sense implying that the school is "equally effective" for students of high as for students of low input scores. If a given school did not actually get students at a particular level of input, it is assumed that if it did, it would do as well with them as with those it actually received, i.e., that the regression lines may be validly extended beyond their observed ranges.

In actual research the homogeneity of the within-group regression slopes can be examined to see if ANCOVA can be applied with this assumption at all. However, the really crucial assumptions will in general be untestable, viz., whether the true effect is appropriately simulated by the ANCOVA model, especially whether all other influences operating before, at, or after input are in fact independent of both the treatment effect and the covariates. As a consequence, the interpretation of the ANCOVA results is speculative and should be so labeled. The findings will be useful only to the degree that th serve to engender scientific progress, not as a statement about the existence or nonexistence of school effects. One surely would be foolish to assert from ANCOVA results that a middle class suburban school would do as well with slum children. Despite these hazards, researchers in the physical sciences have found oversimplified models of reality useful, if only to have something specific to disprove.

For the purpose of considering the implications of random errors of measurement in the covariate we will assume that the ANCOVA model (equation (1)) is appropriate, especially the theoretical assumption that a common within-group regression slope can be used to adjust for mean differences in the covariate (Smith, 1957). As a consequence the A_j intercepts in equation (1) can be estimated from equation (2):

$$\hat{A}_j = \bar{Y}_j - B_w\bar{X}_j \tag{2}$$

where $\bar{Y}_j$ = sample mean of Y_{ij} for group j,

and $\bar{X}_j$ = sample mean of X_{ij} for group j.

For heuristic purposes it is useful to substitute equation (2) into equation (1) yielding:

$$Y_{ij} = \bar{Y}_j - B_w\bar{X}_j + B_wX_{ij} + e_{ij} \quad . \tag{3}$$

If in fact one first computes $\bar{Y}_j$ and $\bar{X}_j$ for each group and assigns these values to individuals in the regression equation

$$Y_{ij} = B_1\bar{Y}_j + B_2\bar{X}_j + B_3X_{ij} + e_{ij} \quad ,$$

it will be found that the regression coefficients $B_1 = 1$, $B_2 = -B_3$, and $B_3 = B_W$ pooled within-group regression slope. This procedure is a simple transformation of the dummy variable approach to ANCOVA discussed by Cohen (1968) and one could perform similar statistical manipulations. Equation (3) is of heuristic interest because it shows that it is the within-groups regression slope, not the between groups or total slope which is the theoretically interesting quantity from the point of this particular model. If the most effective schools get the best students (i.e., $r_{AX} > 0$ in equation (1)), the between and the total slopes will differ from the within slope (violating the ANCOVA assumption that between and within slopes be homogeneous) but our theory as stated in equation (3) indicates that this will not affect estimates of the intercepts or therefore the ordering of schools for effectiveness. Because of the homogeneity of within-group regression the ordering and variance of the intercepts will be the same as the ordering and variance of the adjusted means. Given that the adjusted means significantly differ from each other, the alternate hypothesis that these differences may be due to unreliability needs to be explored. Because reliability coefficients are usually unavailable, our focus will be on stating the conditions under which it is reasonable to believe that corrections for unreliability should (at least in theory) increase the spread (i.e., the variance) of the adjusted means.

It should be emphasized that equation (2) indicates that the intercepts are a residual quantity representing that part of the output means not accounted for by the input means. Therefore the finding of a residual school effect (adjusted between school) variance in no sense is positive evidence that the school does have an effect, only that we have not proven that it doesn't. Even if input were adequately controlled, the numerous events happening outside of school during the study might well explain much of the residual variance.

Unreliability

According to the classical theory of unreliability, because of random errors of measurement, a person whose score is deviant on one test will on the average have a score closer to the mean on a parallel form of that test (Lord & Novick, 1968, pp. 64-66). One problem in correcting the covariate for unreliability is that a priori we do not know whether on a parallel form the scores for an individual will tend to regress towards the mean of his school (i.e., school means are infallible) or towards the overall covariate mean (fallible school means). The former alternative would imply that the school mean itself should be the same on both parallel forms, whereas the latter would imply that the school mean itself would "regress" towards the overall mean on the parallel form. It follows that if school input score and output score were parallel forms of the same test, no change in the school means over time would indicate no effect if alternate forms given at input also yielded similar means, but would suggest an effect if the input alternate forms showed "regression" of the school means towards the overall mean. Similarly if over time there was "regression" of the means towards the overall score, then this might or might not be explainable in terms of unreliability. In actual school effects studies such alternatives can seldom be tested because of the lack of parallel forms and lack of independence of the measurement errors from the school effect, other covariates, and the output variable. Furthermore, even if an input variable like social class background could be perfectly measured, this variable is typically used as a surrogate for variables like family values which means that lack of validity will be the more serious hazard to interpretation.

It follows from the above discussion that two cases need to be treated: (a) when the errors of measurement in the covariate are distributed randomly with a zero mean for the total sample irrespective of group in which case the overall mean on the observed covariate is assumed to be equal to the mean value of the true scores, i.e., the observed group means are assumed to be fallible and (b) when the errors of measurement in the covariate are distributed randomly within groups and have a zero mean within groups, in which case the observed group means are assumed to equal the mean value of the true scores for the persons in that group. For case (a)

1.1 The variance of the true covariate scores (σ_x^2) will equal:

$$\sigma_x^2 = r_{XX}\sigma_X^2 \quad ,$$

where r_{XX} = reliability,

and σ_X^2 = observed variance of the covariate.

1.2 The variance of the true group means $(\sigma_{\bar{x}}^2)$ when assigned to individuals in equation (3):

$$\sigma_{\bar{x}}^2 = r_{XX}\sigma_{\bar{X}}^2 \quad .$$

1.3 In terms of true scores indicated by lower case letters,

$$Y_{ij} = B_1\bar{Y}_j + B_2\bar{x}_j + B_3x_{ij} + e_{ij} \quad .$$

1.4 The normal equations are:

$$\sigma_{Y\bar{Y}} = B_1\sigma^2_{\bar{Y}} + B_2\sigma_{\bar{Y}\bar{X}} + B_3\sigma_{\bar{Y}X} \quad ,$$

$$\sigma_{Y\bar{X}} = B_1\sigma_{\bar{Y}\bar{X}} + B_2\sigma^2_{\bar{X}} + B_3\sigma_{\bar{X}X} \quad , \text{ and}$$

$$\sigma_{YX} = B_1\sigma_{\bar{Y}X} + B_2\sigma_{\bar{X}X} + B_3\sigma^2_{X} \quad .$$

1.5 To obtain the normal equations in terms of observed scores the following relationships are useful:

(a) The covariances among the true scores are identical to the covariances among the observed scores (DuBois, 1957).

(b) When group means are assigned to individuals as in equation (3) the covariance of X with $\bar{X}$ will equal the variance of the group means, i.e., $\sigma_{X\bar{X}} = \sigma^2_{\bar{X}}$ and $\sigma_{Y\bar{Y}} = \sigma^2_{\bar{Y}}$.

(c) Likewise the covariance of X with $\bar{Y}$ will equal the covariance of $\bar{X}$ and $\bar{Y}$, i.e., $\sigma_{X\bar{Y}} = \sigma_{\bar{X}\bar{Y}}$.

1.6 By substitution the normal equations become

$$\sigma^2_{\bar{Y}} = B_1\sigma^2_{\bar{Y}} + B_2\sigma_{\bar{Y}\bar{X}} + B_3\sigma_{\bar{Y}\bar{X}} \quad ,$$

$$\sigma_{\bar{Y}\bar{X}} = B_1\sigma_{\bar{Y}\bar{X}} + B_2 r_{XX}\sigma^2_{\bar{X}} + B_3 r_{XX}\sigma^2_{\bar{X}} \quad , \text{ and}$$

$$\sigma_{YX} = B_1\sigma_{\bar{Y}\bar{X}} + B_2 r_{XX}\sigma^2_{\bar{X}} + B_3 r_{XX}\sigma^2_{X} \quad .$$

1.7 Solution of these equations yields

$$B_1 = 1 \ , \quad B_2 = -B_3 \ , \quad B_3 = \frac{B_w}{r_{XX}} \quad ,$$

where B_w = pooled within-group regression for observed scores.

1.8 Since the true intercepts equal $B_1\bar{Y}_j + B_2\bar{x}_j$, the variance of the true intercepts (σ_a^2) will be:

$$\sigma_a^2 = B_1^2\sigma_{\bar{Y}}^2 + B_2^2\sigma_{\bar{x}}^2 + 2B_1B_2\sigma_{\bar{Y}\bar{x}} \quad .$$

1.9 By substitution

$$\sigma_a^2 = \sigma_{\bar{Y}}^2 + \frac{B_w^2\sigma_{\bar{X}}^2}{r_{XX}} - 2\,\frac{B_w}{r_{XX}}\,\sigma_{\bar{Y}\bar{X}} \quad .$$

1.10 This may be compared with the observed variance among intercepts (σ_A^2) ,

$$\sigma_A^2 = \sigma_{\bar{Y}}^2 + B_w^2\sigma_{\bar{X}}^2 - 2B_w\sigma_{\bar{Y}\bar{X}} \quad .$$

1.11 Comparison of σ_a^2 to σ_A^2 indicates the "true" variation of the intercepts may be larger or smaller than the observed variation of the intercepts.

1.12 Since $\sigma_{\bar{Y}\bar{X}} \div \sigma_{\bar{X}}^2 = B_{\bar{Y}\bar{X}}$, comparison of step 1.9 to 1.10 indicates that for σ_a^2 to be greater than σ_A^2 either:

(a) B_w and $B_{\bar{Y}\bar{X}}$ must be opposite sign, or

(b) if B_w and $B_{\bar{Y}\bar{X}}$ are of the same sign then the absolute value of B_w must be greater than twice the absolute value of $B_{\bar{Y}\bar{X}}$.

When the group mean is the expected mean value of the true scores for the persons in that group:

2.1 The observed variance of the covariate means will equal the variance of the "true" means:

$$\sigma_{\bar{x}}^2 = \sigma_{\bar{X}}^2 \quad .$$

2.2 When it is assumed that the within-group reliability of the covariate scores is the same for all schools, the within-group variance (σ^2_{xw}) of the true scores will equal the reliability (r_{XX}) times the within-group variance (σ^2_{XW}) ;

$$\sigma^2_{xw} = r_{XX}\sigma^2_{XW} = r_{XX}(\sigma^2_{X} - \sigma^2_{\bar{X}}) \quad .$$

2.3 It follows that the total variance of the true scores (σ^2_{x}) is

$$\sigma^2_{x} = \sigma^2_{\bar{x}} + \sigma^2_{xw} = \sigma^2_{\bar{X}} + r_{XX}\sigma^2_{XW} \quad .$$

2.4 The regression equation equivalent to equation (3) is (lower cases indicating true scores)

$$Y_{ij} = B_4\bar{Y}_j + B_5\bar{x}_j + B_6x_{ij} + e_{ij} \quad .$$

2.5 The normal equations are:

$$\sigma_{Y\bar{Y}} = B_4\sigma^2_{\bar{Y}} + B_5\sigma_{\bar{Y}\bar{x}} + B_6\sigma_{\bar{Y}x} \quad ,$$

$$\sigma_{Y\bar{x}} = B_4\sigma_{\bar{Y}\bar{x}} + B_5\sigma^2_{\bar{x}} + B_6\sigma_{\bar{x}x} \quad , \text{ and}$$

$$\sigma_{Yx} = B_4\sigma_{\bar{Y}x} + B_5\sigma_{\bar{x}x} + B_6\sigma^2_{x} \quad .$$

2.6 By substitution as before

$$\sigma^2_{\bar{Y}} = B_4\sigma^2_{\bar{Y}} + B_5\sigma_{\bar{Y}\bar{X}} + B_6\sigma_{\bar{Y}\bar{X}} \quad ,$$

$$\sigma_{\bar{Y}\bar{X}} = B_4\sigma_{\bar{Y}\bar{X}} + B_5\sigma^2_{\bar{X}} + B_6\sigma^2_{\bar{X}} \quad , \text{ and}$$

$$\sigma_{YX} = B_4\sigma_{\bar{Y}\bar{X}} + B_5\sigma^2_{\bar{X}} + B_6(\sigma^2_{\bar{X}} + r_{XX}\sigma^2_{XW}) \quad .$$

2.7 Solution of these equations yields

$$B_4 = 1 \ , \quad B_5 = -B_6 \ , \text{ and } \ B_6 = B_w = \text{pooled within slope.}$$

2.8 Since the true intercepts equal $B_4\bar{Y}_j + B_5\bar{x}_j$, the variance of the true intercepts (σ^2_a) will be:

$$\sigma^2_a = B^2_4\sigma^2_{\bar{Y}} + B^2_5\sigma^2_{\bar{x}} + 2B_4B_5\sigma_{\bar{Y}\bar{x}} \quad .$$

2.9 Which by substitution is

$$\sigma^2_a = \sigma^2_{\bar{Y}} + \frac{B^2_w\sigma^2_{\bar{X}}}{r^2_{XX}} - 2\,\frac{B_w}{r_{XX}}\,\sigma_{\bar{Y}\bar{X}} \quad .$$

2.10 This again may be compared with the observed variance of the intercepts

$$\sigma^2_A = \sigma^2_{\bar{Y}} + B^2_w\sigma^2_{\bar{X}} - 2B_w\sigma_{\bar{Y}\bar{X}} \quad .$$

2.11 A comparison of 2.9 and 2.10 indicates that σ^2_a will be larger than σ^2_A when

$$\left(\frac{B^2_w\sigma^2_{\bar{X}}}{r^2_{XX}} - 2\,\frac{B_w}{r_{XX}}\,\sigma_{\bar{Y}\bar{X}}\right) > \left(B^2_w\sigma^2_{\bar{X}} - 2B_w\sigma_{\bar{Y}\bar{X}}\right) \quad .$$

2.12 Since $B_{\bar{Y}\bar{X}} = \sigma_{\bar{Y}\bar{X}} \div \sigma^2_{\bar{X}}$ we find that σ^2_a is greater than σ^2_A when

$$\frac{B^2_w}{r^2_{XX}} - 2\,\frac{B_wB_{\bar{Y}\bar{X}}}{r_{XX}} > B^2_w - 2B_wB_{\bar{Y}\bar{X}} \quad .$$

2.13 It can be shown that the inequality in 2.12 will hold if

$$B_W^2(1 + r_{XX}) > 2r_{XX}B_W B_{\bar{Y}\bar{X}}$$

which for $0 < r_{XX} < 1.0$ is true for the following conditions: (a) B_W and $B_{\bar{Y}\bar{X}}$ have opposite signs or (b) B_W and $B_{\bar{Y}\bar{X}}$ have the same signs and

$$\left|B_W\right| > \frac{2r_{XX}}{1 + r_{XX}} \left|B_{\bar{Y}\bar{X}}\right| \quad .$$

Thus σ_a^2 is always greater than σ_A^2 when B_W and $B_{\bar{Y}\bar{X}}$ have opposite signs and if B_W and $B_{\bar{Y}\bar{X}}$ have the same sign, then σ_a^2 is greater than σ_A^2 when the absolute value of B_W is greater than the absolute value of $B_{\bar{Y}\bar{X}}$ multiplied by $2r_{XX}/(1 + r_{XX})$. Since $2r_{XX}/(1 + r_{XX})$ will always be less than 1.0, it follows that where B_W and $B_{\bar{Y}\bar{X}}$ have the same sign then $\sigma_a^2 > \sigma_A^2$ when $|B_W| > |B_{\bar{Y}\bar{X}}|$.

Discussion

The above derivations can be summarized as follows:

1. When the internal slope (B_W) and the external slope $(B_{\bar{Y}\bar{X}})$ are of opposite sign, then a correction for unreliability should (in theory) result in an increase in the spread of the adjusted means.

2. When the internal slope (B_W) and the external slope are of the same sign, then the effect of correcting for unreliability depends on whether the errors are distributed randomly (and with zero mean) without respect to groups or are distributed randomly with zero means within groups. In the former case the group means are considered fallible and correcting for unreliability should increase the spread of the adjusted means if the absolute value of the internal

slope is at least twice the absolute value of the external slope. In the latter case, the group means are considered infallible and corrections should increase the spread of the adjusted means if the absolute value of the internal slope is at least as large as the absolute value of the external slope multiplied by a fraction which depends on the magnitude of the reliability. Since the former procedure is more conservative than the latter, it should perhaps be preferred in the absence of information about the distribution of the errors. If reliability estimates are available, then those values could be substituted into the relevant equations and inferences made about the effect on the spread of the adjusted means. The procedures outlined by Porter (1967) and Thistlethwaite (1968) deal only with the case where the errors of measurement in the covariate are distributed randomly and have a zero mean <u>within</u> groups. Our conclusions for this case are in only partial agreement with those of Thistlethwaite who suggested that whenever the absolute value of the internal slope exceeds that of the external slope, reliability corrections will increase the spread of the adjusted means. Our analyses show that the spread of the intercepts will also be increased when the internal and external slopes have opposite signs or when they have the same sign but the absolute value of the internal slopes exceeds the absolute value of the external slope times a fraction that is less than one.

The generalizations in the paper were developed for the case of a single covariate. When multiple covariates are employed a comparison of the magnitude of the variance of the intercepts with and without reliability corrections depends not only on the relative magnitudes of the internal and corresponding external slopes but also on the relative magnitudes of the covariances among the covariates. In the case of multiple covariates, it is possible to derive the relevant normal equations as we have done and then to observe the effect of varying reliability values on the spread of the adjusted means.

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Footnote

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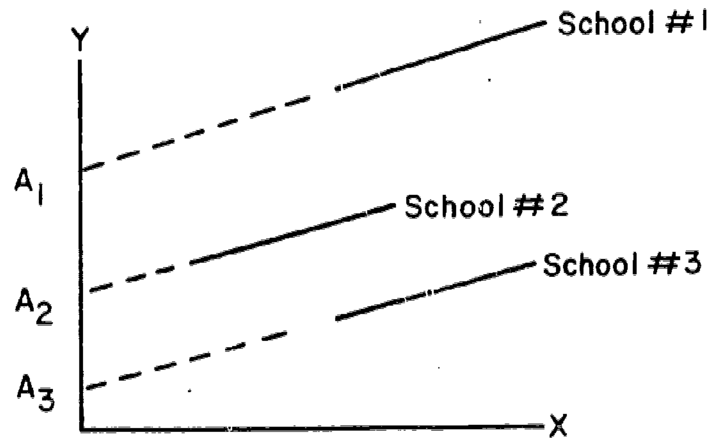
Figure Caption

Figure 1. The Model for ANCOVA.


Y
School #1
A_1
School #2
School #3
A_2
A_3
X

THE PATH ANALYSIS OF CATEGORICAL DATA

Charles E. Werts and Robert L. Linn

Abstract

Consideration of the model equations for analysis of covariance and analysis of variance indicates that these methods can be expressed in terms of a regression equation which then can be interpreted by the technique of path analysis. The heuristic advantages of this procedure and the necessary assumptions are discussed.

The Path Analysis of Categorical Data*

Charles E. Werts and Robert L. Linn

Since its introduction into the sociological literature by Duncan, path analysis has proven to be a powerful heuristic tool in the study of causal networks.[1] Although path analysis has been used mainly with continuous or dichotomous data, we shall consider the heuristic advantages of dealing with categorical variables such as nations, schools or religions within the same framework. Our discussion shall be in the context of school effects research; however, many of the same considerations apply to the study of other categorical variables. Our purpose is to demonstrate the ability of path analysis to handle problems previously cast in some restrictive framework such as analysis of covariance or analysis of variance.

What Is a "Good" or "Bad" Institution?

Suppose that a school superintendent came to a social scientist and asked the following question: "There are three schools in my district which teach 9th grade American History and we measured the students' knowledge of this subject at the beginning of the year and again at the end of the year on the same test. Which of these schools was the best and which the worst in teaching history?" To answer this question the researcher is likely to postulate that output is influenced by input and the school effect. Many experienced researchers would first compute the regression slopes of output scores on input scores separately for each school. If the slopes of these regression lines were homogeneous, the most common choice of method would be the analysis of variance with a covariance adjustment (ANCOVA).[2] Since it may be expected that the "best" schools get the "best" students, in ANCOVA terminology the treatment effect would be correlated with the covariate due to lack of randomness. Violations of this basic assumption of ANCOVA can have serious consequences. Although the ANCOVA technique therefore is frequently inappropriate to naturalistic school studies, it is instructive to consider the precise form of the implied definition of "good" school.[3] Figure 1 illustrates the case of parallel within-school regression lines. When properly used, ANCOVA

- - - - - - - - - - - - - -
Insert Figure 1 about here
- - - - - - - - - - - - - -

yields an estimate of the intercepts (i.e., A_1, A_2, and A_3 in Figure 1) of the output on input regression lines and a test of whether these intercepts differ significantly. The implied definition is that each school adds a constant amount to each of its students. If this constant amount, estimated by the intercepts, is the same for all schools, then the variance of the intercepts will be essentially zero. In Figure 1, a student of a given level of knowledge (i.e., input) on entry will gain more knowledge by attending school #1 than school #2 by $(A_1 - A_2)$ units and more by attending school #2 than school #3 by $(A_2 - A_3)$ units of output. The difference between the intercepts is the same as the difference between the "adjusted means." The school effect being studied is more precisely the differential school effect as indicated by the differences among the intercepts. The <u>crucial theoretical question for the researcher is whether it is reasonable to believe that schools differ in their effectiveness by the same amount regardless of the input level of the students...that it is reasonable to believe that each school adds a constant amount to its students</u>. For large multiversities the case would be difficult to argue.

Why check the slope of the regression lines? Consider Figure 2 where

Insert Figure 2 about here

schools with different regression lines are shown. The definition of "good" becomes unclear because school #1 is "best" for students whose input scores are less than point I on the abscissa (the intersection of the regression lines) and school #2 is "best" for students whose input scores are more than I. Many combinations are possible, e.g., within the effective input ranges of a pair of schools, the regression line of one school might be higher at all points than that of another school, in which case the former school is clearly the "best" in general although better for some than others. In algebraic terms:

$$Y_{ij} = A_j + B_j X_{ij} + e_{ij} \tag{1}$$

where Y_{ij} = output,

A_j = intercept of group j,

B_j = slope of group j (unstandardized),

X_{ij} = input for student i in group j,

e_{ij} = extraneous factors assumed independent of input.

Bottenberg and Ward show how to deal with this problem in general.[4] When one is studying a considerable number of schools, any and all of the above combinations may be present, which means that the general notion of ranking schools from "best" to "worst" becomes untenable unless the within-school regression lines are parallel. It follows that investigators would be advised to check the within-school regression slopes. Our development of path analysis for categorical variables will assume that the within-school slopes are homogeneous for each and every covariate so that it is reasonable to talk about relatively "good" and "bad" schools as measured by the variance of the regression intercepts. In practice the more difficult assumption to justify will be that extraneous variables are uncorrelated with the independent variable.

Treatment of Categorical Variables

The model equation for the unstandardized form of path analysis with two continuous independent variables is:

$$Y_i = B_1 W_i + B_2 X_i + e_i. \tag{2}$$

The model equation for ANCOVA is the special case of equation (2) in which the unstandardized regression weight for the categorical variable is equal to 1. Thus when W is the intercept of a categorical variable like schools, equation (2) becomes

$$Y_{ij} = W_{ij} + B_2 X_{ij} + e_{ij}, \tag{3}$$

where W_{ij} is a constant for all i with a fixed j.

The unstandardized version of path analysis is better adapted to categorical analysis since for each categorical variable the unstandardized regression weight is one which in essence means that categories have been scaled in terms of their "effect" on output. Notice that the actual correlations cannot be computed directly as in the usual path analysis, because the intercepts have to be computed first.

Given the model equation, i.e., (3), the researcher can proceed to obtain the normal equations in the manner shown by Duncan:[5]

1. For unstandardized path analysis:

   (a) $Y_{ij} = W_{ij} + B_2 X_{ij} + e_{ij}.$

   (b) Assuming that e is uncorrelated with W and X,

   $$\sigma_{YW} = \sigma_W^2 + B_2 \sigma_{WX}, \tag{4}$$

where σ_{YW} is the covariance of Y and W,

σ_W^2 is the variance of the intercepts,

σ_{WX} is the covariance of W and X,

and B_2 is the within-group regression coefficient.

(c) Similarly,

$$\sigma_{YX} = \sigma_{WX} + B_2\ \sigma_X^2, \tag{5}$$

where σ_{YX} is the covariance of Y and X,

and σ_X^2 is the variance of X.

(d) The variance of Y, σ_Y^2, is given by

$$\sigma_Y^2 = \sigma_{YW} + B_2\ \sigma_{YX}. \tag{6}$$

(e) By substitution from equations (4) and (5),

$$\sigma_Y^2 = \sigma_W^2 + B_2^2\ \sigma_X^2 + 2\ B_2\ \sigma_{WX} + \sigma_e^2, \tag{7}$$

where σ_e^2 is the variance of e.

(f) In terms of predictable variance,

$$\sigma_Y^2 - \sigma_e^2 = \sigma_{\hat{Y}}^2 = \sigma_W^2 + B_2^2\ \sigma_X^2 + 2\ B_2\ \sigma_{WX}. \tag{8}$$

Thus the predictable variance is the sum of the variance due to the differential school effect, σ_W^2 plus variance due to input $B_2^2\ \sigma_X^2$ plus a factor $2\ B_2\ \sigma_{WX}$ due to nonrandom assignment of students to schools.

All these equations may be translated to their more familiar standardized path coefficient (b*) form:

1. Divide equation (4) by $(\sigma_Y)(\sigma_W)$

$$\frac{\sigma_{YW}}{\sigma_Y\ \sigma_W} = \frac{\sigma_W^2}{\sigma_Y\ \sigma_W} + \frac{B_2\ \sigma_{WX}}{\sigma_Y\ \sigma_W}. \tag{9}$$

2. By definition

(a) $r_{YW} = \dfrac{\sigma_{YW}}{\sigma_Y \ \sigma_W}$, (b) $r_{WX} = \dfrac{\sigma_{WX}}{\sigma_W \ \sigma_X}$,

(c) $b_1^* = \dfrac{\sigma_W}{\sigma_Y}$ (since $B_1 = 1$), and

(d) $b_2^* = B_2 \dfrac{\sigma_X}{\sigma_Y}$.

3. By substitution into equation (9),

$$r_{YW} = b_1^* + b_2^* \ r_{WX} \ . \tag{10}$$

4. Repeating the procedure for equations (5) and (7)

$$r_{YX} = b_1^* \ r_{WX} + b_2^* \ , \tag{11}$$

$$1 = (b_1^*)^2 + (b_2^*)^2 + 2 \ b_1^* \ b_2^* \ r_{WX} + \sigma_e^2 \ , \tag{12}$$

or

$$R^2_{Y.WX} = (b_1^*)^2 + (b_2^*)^2 + 2 \ b_1^* \ b_2^* \ r_{WX} \ , \tag{13}$$

where $R_{Y.WX}$ is the multiple correlation W and X with Y.

Equations (10), (11), (12), and (13) are the familiar path equations.

It remains to show how the various components can be calculated using dummy variable analysis.[6] The dummy variable equivalent of equation (3) for three schools is:

$$Y_{ij} = B_0' \ Z_0 + B_1' \ Z_1 + B_2' \ Z_2 + B_w X_{ij} + e_{ij} \ , \tag{14}$$

where Z_0 = coded 1 for everybody,

Z_1 = 1 for persons in school 1, 0 for others,

Z_2 = 1 for persons in school 2, 0 for others,

B_w = pooled within-group regression coefficient.

Persons in school #1 would be assigned the codes $Z_0 = 1$, $Z_1 = 1$ and $Z_2 = 0$; those in school #2, $Z_0 = 1$, $Z_1 = 0$, $Z_2 = 1$; and those in school #3, $Z_0 = 1$, $Z_1 = 0$, $Z_2 = 0$. In equation (14) the regression weight B_0' is the intercept of the group which is coded $Z_1 = Z_2 = \ldots = Z_n = 0$, i.e., school #3 in our example. The intercept for school #2, $W_{i1} = B_0' + B_1'$ and for school #2 $W_{i2} = B_0' + B_2'$ or in general $W_{ij} = B_0' + B_j'$. One could assign the value of the intercepts to the persons in the respective schools and proceed to calculate correlations, etc. as in the usual path analysis.

A person wishing to avoid a dummy variable analysis can simply use a routine ANCOVA program to obtain the adjusted school means (and if possible to test for homogeneity of within-group regression) and then assign the value of these adjusted means to the persons in the respective groups and proceed with the usual path analysis via correlations.[7]

The model equation for 2 categorical independent variables (W and X) is:

$$Y_i = W_j + X_k + e_i \quad . \tag{15}$$

This is merely the special case of equation (2) in which $B_1 = B_2 = 1$, individuals being again assigned the values of W and X for their respective groups j and k. Equation (15) is the model for 2-way analysis of variance (ANOVA) with no interaction effect; however, in naturalistic studies W and X cannot be expected to be independent as required by ANOVA. The normal equations are:

1. We obtain as before

$$\sigma_{YW} = \sigma_W^2 + \sigma_{WX} \ ,$$

$$\sigma_{YX} = \sigma_{WX} + \sigma_X^2 \ ,$$

$$\sigma_Y^2 = \sigma_W^2 + \sigma_X^2 + 2\sigma_{WX} + \sigma_e^2 \; ,$$

and $$\sigma_{\hat{Y}}^2 = \sigma_W^2 + \sigma_X^2 + 2\sigma_{WX} \; .$$

2. Or in standardized form

$$r_{YW} = b_1^* + b_2^* \, r_{WX} \; ,$$

$$r_{YX} = b_1^* \, r_{WX} + b_X^* \; ,$$

$$R^2_{Y.WX} = (b_W^*)^2 + (b_X^*)^2 + 2 \, b_W^* \, b_X^* \, r_{WX} \; .$$

The values of W and X can be obtained from dummy variable analysis as shown by Johnston.[8] The researcher's job in these analyses is to justify substantively the assertion that each grouping along dimension W or X adds a constant amount to each of its members and that it is theoretically meaningful to think of W and X as separate (but possibly correlated) effects on the dependent variable. It is always possible to modify equation (15) to include interaction between categories of W and X, which amounts to adding additional independent variables. If interaction terms are employed, the user should be thoroughly aware of the problems due to collinearity which are likely to be introduced and which Gordon has shown to have serious theoretical consequences.[9] When the values of W and X are assigned to individuals, it is useful to do the analysis on a standard regression routine which will yield the standardized regression weights for W and X along with correlations, unstandardized regression weights, variances and covariances. This way the advantages of standardized and unstandardized coefficients can be retained.[10]

Discussion

The introduction of categorical variables into any analysis must a priori be justified on substantive grounds, i.e., is it meaningful to order this particular set of groups along this particular dependent variable? In input-output studies of institutions, lack of homogeneity of the within-group regression casts doubt on the meaningfulness of such an ordering. Given the necessary assumptions, the analysis presented above indicated that the effect of this set of categories can for heuristic purposes be considered a single variable. Thus in school effects studies one may think of a school effect and an input effect influencing output. It should not, however, be forgotten that all we mean by such a statement is that there is some residual association between the category (e.g., school) and the dependent variable which is not explained when the other independent variables are controlled--which is not equivalent to saying that the categories do in fact have an effect. It follows that the next study should try to "explain" this residual association by introducing the mechanisms responsible for the categorical effect as intervening variables between the categorical variable and the dependent variable. The advantage of casting the problem in terms of path analysis is that the meaning of the regression coefficients can be interpreted in terms of the theoretically relevant causal ordering of the variables, whether they be categorical or not, e.g., distinguishing between common antecedent vs. intervening variables. A further advantage of casting the analysis of covariance in the path framework is that the various techniques like elaboration, contextual analysis, ecological correlation, latent structure analysis and Guttman scale analysis, which Schuessler[11] shows to be interpretable in terms of analysis of covariance can be accomplished by path analysis.

As any statistician can easily demonstrate, the mathematics of path analysis is merely a special subset of the mathematics used in connection with the general linear model.[12] The value of path analysis is therefore mainly heuristic--promoting clearer thinking about the whole network of variables and the kinds of assumptions inherent in any interpretation thereof. It is nonetheless true that casting the analysis in path analytic terms allows one to incorporate multiple measures of the same covariate and to consider explicitly the identification problem by setting up a model which includes hypothetical unmeasured variables--a process which is difficult to accomplish with any other available technique.

Footnotes

[*]The research reported herein was performed pursuant to Grant No. OEG-1-6-061830-0650 Project No. 6-1830 with the Office of Education, U. S. Department of Health, Education, and Welfare.

[1]Duncan, O. D. Path analysis: sociological examples. American Journal of Sociology, 1966, 72(1), 1-16.

[2]There are two basic types of analysis of covariance. The most commonly used and the one we discuss is the analysis of variance with a covariance adjustment, i.e., one or more independent variables are partialed out. The other type which computes regression lines for each cell and tests their homogeneity to see if the error variance is homogeneous is not discussed herein (see Gulliksen, H. and Wilks, S. S. Regression tests for several examples. Psychometrika, 1950, 15, 91-114).

[3]Evans, S. H. and Anastasio, E. J. Misuse of analysis of covariance when treatment effect and covariate are confounded. Psychological Bulletin, 1968, 69, 225-234.

[4]Bottenberg, R. A. and Ward, J. H., Jr. Applied multiple linear regression. PRL-TDR-63-6. Lackland Air Force Base, Texas, 1963.

[5]Duncan, O. D., op. cit.

[6]A good discussion of dummy variable analysis is provided by Johnston, J. Econometric methods. New York: McGraw-Hill, 1960. Pp. 221-228.

[7]Persons with training in the general linear model will recognize that all interesting quantities for the path analysis could be calculated in a single computer run. When the adjusted means are assigned to individuals, ANCOVA is equivalent to subtracting the squared multiple correlation of the

covariates with the dependent variable from the squared multiple correlation of all variables with the dependent variable and testing this with the error variance. It follows that ANCOVA is equivalent to obtaining the part correlation of the adjusted means with output whereas the path analysis procedure uses regression coefficients (see Werts, C. E. and Linn, R. L., Considerations when making causal inferences within the analysis of covariance model, 1969, unpublished paper).

[8]Johnston, J., _op. cit._

[9]Gordon, R. A. Issues in multiple regression. _American Journal of Sociology_, 1960, _73_, 592-616.

[10]Blalock, H. M. Causal inference, closed populations, and measures of association. _American Political Science Review_, 1967, _61_, 130-136.

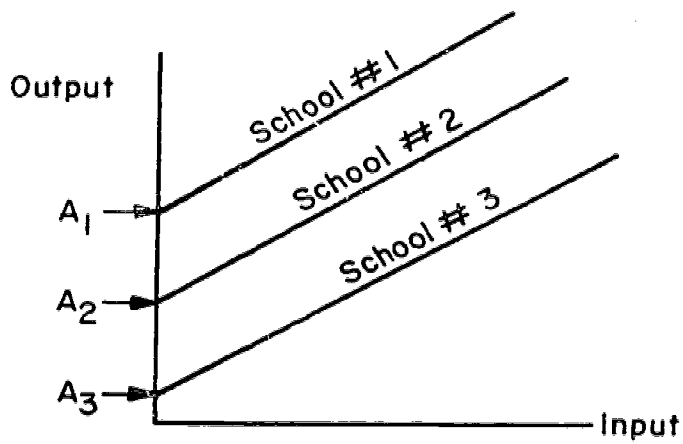
[11]Schuessler, K. Covariance analysis in sociological research in E. F. Borgatta (Ed.), _Sociological methodology_, 1969. York, Pennsylvania: Josscy-Bass, 1968.

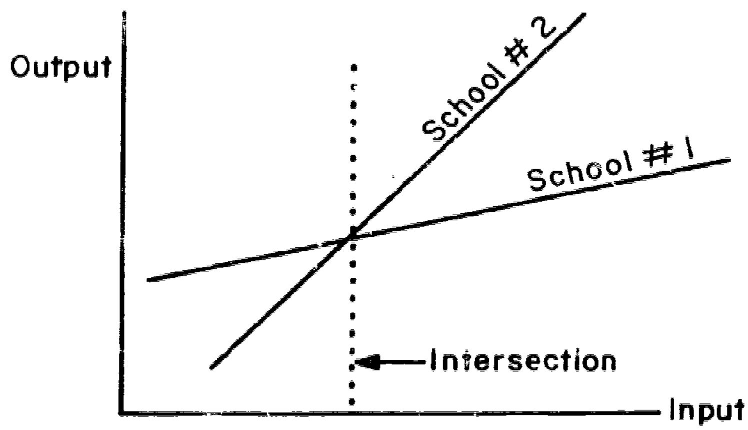
[12]A discussion of the general linear model may be found in Li, J. C. R. _Statistical inferences_, Vol. II. _The multiple regression and its ramifications_, Ann Arbor, Michigan: Edwards Bros., 196[illegible]. While it is true that all the algebra of path analysis could be encompassed in the general linear model, Dr. Duncan in a personal communication points out that path analysis "provides some techniques of manipulating hypothetical causal systems that would probably never come to mind if one concentrated solely on the statistical properties of the general linear model."

Figure Captions

Figure 1. The ANCOVA Model.

Figure 2. Nonparall-l Regression Lines.


Output
School #1
School # 2
School # 3
A_1
A_2
A_3
Input


Output
School # 2
School # 1
Intersection
Input

A REGRESSION MODEL FOR STUDYING GROWTH

Charles E. Werts and Robert L. Linn

Abstract

The determinants of change are assumed to be represented by a linear regression model. The implications of using raw difference scores and of using residual change scores are evaluated within the framework of this model. Given the regression model and a determinant of change (Z) other than initial status (X), use of the above traditional measures of change results in biased estimates of the influence of Z on change when X and Z are correlated. Parallel results are obtained when the measures are treated as error free and when they are treated as fallible.

A REGRESSION MODEL FOR STUDYING GROWTH[1]

Given a test score at one time and a score on the same or a parallel test at a later time, the most common procedure is to remove the effect of initial status by regressing the final score on the initial score, yielding the deviation of the final score from its predicted value. This deviation score is then used to find the correlates of change even though this measure is not a direct measure of the real change. The reason for this usage is to guarantee "that the variables found associated with gain are not found simply because they happen to be associated with initial status" (Lord, 1963, p. 24). The raw difference score (final minus initial status) would be subject to this problem. Lord also notes the importance of correcting for unreliability when obtaining correlates of the change variable or when estimating change for an individual. In this paper we shall discuss how the same kind of data would be handled in a regression analysis for the purpose of making inferences about the "determinants" of change. While it is easily shown that the regression approach typically yields different results from the traditional approach, it is not possible to state from an examination of the statistics alone which should be used. While the approaches do have different theoretical assumptions (Linn & Werts, 1969), in the absence of specific knowledge about how the influences really operate, we cannot know which would simulate the phenomena more closely. In the discussion which follows, it shall be assumed that the user has justified the relevance of a regression model and wishes to make inferences within this framework. It is our hope that the existence of an alternate analytical model for which the traditional methods would be incorrect will serve as a challenge to clarify both the nature of the questions being asked and the specific limitations of statistical tools in answering these questions.

A. Basic Principles

The first question when applying a regression approach is: What should be the dependent variable? Should it be the raw difference score, the deviation of final status from the value predicted from initial status, or perhaps simply final status? The central concept in answering this question will be that of "specification error" by which is meant the error which results from incorrectly specifying the model for analyzing the data (Theil, 1957). For example, if Y were determined by two correlated influences X_1 and X_2 according to the equation $Y = A + B_1 X_1 + B_2 X_2 + e$, then if X_2 were neglected when computing the effect of X_1, the regression weight for X_1 in this incorrectly specified model would differ from the true regression weight because of specification error. The exact difference can be computed from the "normal" equations in their regression weight form:

1. For the equation $Y = A + B_1 X_1 + B_2 X_2 + e$, $B_{YX_1} = B_1 + B_2 B_{21}$,

   where B_{21} = the regression weight of X_2 on X_1,

   B_{YX_1} = the total regression of Y on X_1 without X_2 in the equation.

2. Thus $B_{YX_1} - B_1 = B_2 B_{21}$. If X_2 and X_1 are uncorrelated, then $B_{21} = 0$ and $B_{YX_1} = B_1$. If B_2 and B_{21} are of the same sign incorrect specification leads to a positive error and if of opposite sign to a negative error.

It is important to note that if X_2 and X_1 are uncorrelated, then the same regression weight for X_1 will be obtained whether or not X_2 is in the equation. It follows directly that if a variable is not included in the regression equation, then the assumption is that either it is not an influence on the dependent variable or, if it is an influence, it is uncorrelated with all the independent variables in the equation. Failure to include relevant influences, then, can in general be expected to result in distorted estimates for all the variables studied. If initial status and other variables are correlated determinants of growth, then neither the effect of initial status nor of the other variables can be correctly specified in a least squares regression model unless they are all used as independent variables in a single regression equation with final status the dependent variable.

In suggesting that initial status may be one determinant of growth, we are making a much stronger statement than that of saying that initial status is correlated with growth. Such usage must be justified by substantive considerations, e.g., perhaps the skills a student enters class with may partly determine the rate at which he can absorb new knowledge in this particular area.

B. Algebraic Consequences of Differing Procedures with Infallible Measures

To understand the interpretations appropriate to a regression model and the differences with the traditional approach it is useful to compare algebraically the consequences of using the traditional growth measures in a regression analysis. Consider an example with infallible measures in which there is a single determinant (Z) of growth other than initial status (X) and the final score (Y) is equal to the initial score (X) plus growth (G). Three procedures will be compared:

(I) Y as the dependent variable, X and Z independent variables;

(II) (Y - X) = G as the dependent variable, X and Z independent variables;

(IIa) $(Y - X) = G$ as the dependent variable, Z the independent variable;

(III) $Y' = (Y - \hat{Y})$ where $\hat{Y} = A + B_{YX} X$ (i.e., Y' is the residual from the regression of Y on X) as the dependent variable, X and Z independent variables; and

(IIIa) $Y' = (Y - \hat{Y})$ as the dependent variable, Z the independent variable.

Case I: 1. The defining equation is

$$Y = G + X = A_1 + B_1 X + B_2 Z + e_1 \quad .$$

2. Solution of the normal equations yields:

$$B_1 = \frac{S_z^2 C_{xy} - C_{zy} C_{xz}}{S_x^2 S_z^2 - C_{xz}^2} = 1 + \frac{S_z^2 C_{xg} - C_{zg} C_{xz}}{S_x^2 S_z^2 - C_{xz}^2} = 1 + B_{GX.Z} \quad ,$$

$$B_2 = \frac{S_x^2 C_{zy} - C_{xy} C_{xz}}{S_x^2 S_z^2 - C_{xz}^2} = \frac{S_x^2 C_{zg} - C_{xg} C_{xz}}{S_x^2 S_z^2 - C_{xz}^2} = B_{GZ.X} \quad ,$$

where S_x^2 is the variance of X ,

S_z^2 is the variance of Z ,

C_{xy} is the covariance of X and Y ,

C_{xg} is the covariance of X and G ,

C_{xz} is the covariance of X and Z ,

C_{yz} is the covariance of Y and Z ,

and C_{gz} is the covariance of G and Z .

3. The regression coefficient for Z is equal to the regression coefficient $B_{GZ.X}$, i.e., the partial regression of growth (G) on Z, X controlled.

4. The regression coefficient for X is equal to the regression coefficient $B_{GX.Z} + 1$, i.e., the regression of growth (G) on X, Z controlled plus 1 (which represents that part of Y which is equal to X).

5. It follows that when the initial status is an independent variable, the regression coefficient for the other independent variable is the influence of that variable on growth.

Case II: 1. The defining equation is

$$G = A_2 + B_3 X + B_4 Z + e_2 \quad .$$

2. Solution of the normal equation yields:

$$B_3 = B_1 - 1 = B_{GX.Z}$$

and

$$B_4 = B_2 \quad .$$

The regression coefficient for Z is thus the same coefficient obtained in Case I, reflecting the influence of Z on growth and the regression coefficient for X is equal to the coefficient in Case I less 1. Thus Case II differs from Case I in that the regression weight for X is decreased by 1 representing the loss of that part of Y which is initial status. Given the results of Case I the coefficient for Case II can be immediately calculated. In both cases the same coefficient for Z would lead to the same conclusions about the influence of Z on growth.

Case IIa: 1. The defining equation is

$$G = A_{2a} + B_4' Z + e_{2a} \quad .$$

2. By the normal equation procedure previously discussed it can be shown that $B_4' - B_4 = B_3 B_{XZ}$.

3. Thus as long as X and Z are correlated, the regression weight for a determinant Z will differ from the true weight and any estimate of G will be similarly distorted. The distorted weight may over- or understate the influence of Z depending on the signs of B_3 and B_{XZ} .

Case III: 1. The defining equation is

$$Y' = Y - A - B_{YX} X = A_3 + B_5 X + B_6 Z + e_3 \quad ,$$

where $B_{YX} = \dfrac{C_{XY}}{S_X^2}$.

2. Since $Y = G + X$,

$$G - A + X (1 - B_{YX}) = A_3 + B_5 X + B_6 Z + e_3 \quad .$$

3. The regression weight for X is related to Cases I and II, i.e.,

$$B_5 = B_3 + 1 - B_{YX} = B_1 - B_{YX} \quad .$$

But from the normal equation for Case I we know that

$$B_{YX} = B_1 + B_2 B_{ZX} \quad .$$

Thus by substitution $B_5 = B_1 - B_1 - B_2 B_{ZX} = - B_2 B_{ZX}$.

4. The regression weight for Z is the same as before, i.e.,

$$B_2 = B_4 = B_6 .$$

5. Case III yields the correct deduction about the influence of Z but gives a weight to initial status which compensates for the difference between the total regression of Y on X and the partial regression of Y on X with Z present. There is clearly no value in Case III over Case I since the same weight for Z is obtained and if desired the weight for X in Case III could be calculated from the results for Case I (to obtain $-B_2 B_{ZX}$) although it seems of little substantive interest.

Case IIIa: 1. The defining equation is

$$Y' = G - A + X (1 - B_{YX}) = A_{3a} + B_6' Z + e_{3a} .$$

2. The normal equation is

$$B_6' = B_6 + B_5 B_{XZ} .$$

But $B_5 = -B_2 B_{ZX}$ and $B_{ZX} B_{XZ} = r_{XZ}^2$. Therefore

$$B_6' = B_6 (1 - r_{XZ}^2) .$$

3. Thus the use of regression corrected growth scores will generally lead to an underestimate of the weight of Z . The greater the correlation of Z with initial status, the greater the degree of underestimation. This method is appropriate to a

least squares model only when the other determinants of growth are uncorrelated with initial status.

C. Algebraic Consequences of Differing Procedures with Fallible Measures

Corrections for unreliability are also appropriate to regression analysis and as in the previous section the consequences relative to traditional approaches can be delineated.

When X and Y are infallible measures, then a simple difference is also infallible. However, when X and Y include errors of measurement, then the simple difference, $G = Y - X$, is also a fallible measure. Following the standard assumptions of classical test theory, assume that:

$$Y = T_Y + E_Y \quad ,$$

$$X = T_X + E_X \quad ,$$

$$\text{and} \quad Z = T_Z + E_Z$$

where the mean errors are zero, and the covariance of any error parts with any true part or other error part is zero.

The raw gain score, G, is

$$G = Y - X \quad ,$$

$$G = T_Y - T_X + E_Y - E_X \quad ,$$

or simply,

$$G = T_G + E_G \quad ,$$

where $T_G = T_Y - T_X$ and $E_G = E_Y - E_X$.

Consider the same basic situation that was discussed in the preceding section: there is a single determinant (T_Z) of growth other than initial status (T_X) and the true output score (T_Y) is equal to the true input score (T_X) plus growth (T_G). The only change from the preceding section is that only fallible measures X, Y, and Z are available for the three variables of interest. The three procedures to be compared are parallel to Cases I, II, and III:

(I*) T_Y as the dependent variable, T_X and T_Z as the independent variables;

(II*) $(T_Y - T_X) = T_G$ as the dependent variable, T_X and T_Z as the independent variables;

(IIa*) $(T_Y - T_X) = T_G$ as the dependent variable, T_Z as the independent variable;

(III*) $T'_Y = (T_Y - \hat{T}_Y)$ where $\hat{T}_Y = A^* + B_{T_Y T_X} T_X$ (i.e., T'_Y is the residual of the regression of T_Y on T_X), as the dependent variable, T_X and T_Z as the independent variables; and

(IIIa*) $T'_Y = (T_Y - \hat{T}_Y)$ as the dependent variable, T_Z as the independent variable. This residual T'_Y is identical to Tucker, Damarin, and Messick's (1966) independent change score.

From classical test theory assumptions it can be shown that:

$$B_{T_Y T_X} = \frac{B_{YX}}{r_{XX}} ,$$

where r_{XX} is the reliability of X, i.e, $r_{XX} = \dfrac{s^2_{T_X}}{s^2_X}$, where $S^2_{T_X}$ is the variance of T_X .

Case I* : 1. The defining equation is

$$T_Y = T_G + T_X = A_1^* + B_1^* \, T_X + B_2^* \, T_Z + e_1^* \quad .$$

2. Solution of the normal equation yields:

$$B_1^* = \frac{r_{ZZ} \, S_Z^2 \, C_{XY} - C_{ZY} \, C_{XZ}}{r_{XX} \, r_{ZZ} \, S_X^2 \, S_Z^2 - C_{XZ}^2} = 1 + \frac{r_{ZZ} \, S_Z^2 \, C_{T_X T_G} - C_{T_X T_Z} \, C_{T_Z T_G}}{r_{ZZ} \, r_{XX} \, S_X^2 \, S_Z^2 - C^2_{T_X T_Z}} = 1 + B_{T_G T_X \cdot T_Z}$$

and

$$B_2^* = \frac{r_{XX} \, S_X^2 \, C_{YZ} - C_{XY} \, C_{XZ}}{r_{XX} \, r_{ZZ} \, S_X^2 \, S_Z^2 - C_{XZ}^2} = \frac{r_{XX} \, S_X^2 \, C_{T_Z T_G} - C_{T_X T_Z} \, C_{T_G T_X}}{r_{XX} \, r_{ZZ} \, S_X^2 \, S_Z^2 - C_{T_X T_Z}} = B_{T_G T_Z \cdot T_X}$$

where r_{ZZ} is the reliability of Z .

Case II*: 1. The defining equation is

$$T_G = A_2^* + B_3^* \, T_X + B_4^* \, T_Z + e_2^* \quad .$$

2. Solution of the normal equation yields:

$$B_3^* = B_1^* - 1 \, ,$$

and

$$B_4^* = B_2^* \quad .$$

Case IIa*: 1. The defining equation is

$$T_G = A_{2a}^* + B_4^{*\prime} \, T_Z + e_{2a}^* \quad .$$

2. The solution for $B_4^{*\prime}$ results in

$$B_4^{*\prime} = B_4^* + \frac{B_3^* \, B_{XZ}}{r_{ZZ}} ,$$

or

$$B_4^{*\prime} = B_4^* + \frac{B_1^* \, B_{XZ}}{r_{ZZ}} - \frac{B_{XZ}}{r_{ZZ}} .$$

Case III*: 1. The defining equation is

$$T_Y' = A_3^* + B_5^* \, T_X + B_6^* \, T_Z + e_3^* ,$$

where

$$T_Y' = T_Y - \hat{T}_Y$$

and

$$\hat{T}_Y = A^* + \frac{B_{YX}}{r_{XX}} \, T_{XX} .$$

2. Solution of the normal equation yields:

$$B_5^* = - \frac{B_2^* \, B_{ZX}}{r_{XX}} ,$$

and

$$B_6^* = B_4^* = B_2^* .$$

Case IIIa*: 1. The defining equation is

$$T_Y' = A_{3a}^* + B_6^{*\prime} \, T_Z + e_{3a}^* .$$

2. The regression coefficient is

$$B_6^{*\prime} = B_6^{*}\left(1 - \frac{r_{XZ}^2}{r_{XX}\ r_{ZZ}}\right) .$$

As can be seen the relationships among Cases I*, II*, IIa*, III*, and IIIa* parallel those among Cases I, II, IIa, III, and IIIa.

D. Implications

The algebraic explorations above indicate:

1. When studying a determinant of growth in a regression model, the determinants and initial status should be independent variables with the final status the dependent variable. This principle can be generalized to multiple determinants.

2. Unreliability of either of the independent variables will distort the regression weights for both the variables. Therefore it is insufficient to correct only for unreliability in the initial status. Even after these corrections, an unknown distortion will remain due to incorrect model specification (Theil, 1957).

3. If the initial status is an independent variable, after corrections for unreliability, the regression coefficients for another determinant will reflect the direct influence of this variable on growth. If initial status is not included in the equation, then the regression coefficient for another determinant of growth will reflect the influence on growth plus a component due to the correlation of initial status with that variable. The better any substitute for initial status, the more the weight for other variables will represent influences on growth.

4. If the growth determinant in question is essentially unrelated to initial status, then its absence will not bias the weight for initial status. Since unreliability in the output measure is (according to traditional psychometric theory) uncorrelated with the independent variables, the regression weight will not be biased by this unreliability.

5. If the correlations among independent variables become very high, not only will the statistical problems of multicollinearity be involved (Farrar & Glauber, 1967), but reasonable substantive interpretation of such results may become almost impossible (Gordon, 1968).

6. The use of a base free measure of change (Tucker, Damarin, & Messick, 1966) is not appropriate to a regression model because a determinant of growth (other than initial status) will in general influence both the independent and the dependent change scores. Only if the determinant is uncorrelated with initial status will the regression of the base free measure on this variable be free of distortion.

7. The above comments apply equally well to the study of group training effects. If Z is a categorical variable such as group membership, then the use of the regression model is equivalent to the analysis of covariance (ANCOVA). For example, Harnqvist (1968) suggests a measure of schooling effect which is the difference between the mean observed final status for that school minus a mean score $\overline{Y}'$ calculated from the equation $\overline{Y}'_i = \alpha + B_{yx}\overline{X}_i$, where B_{yx} is the average within-group regression coefficient and $\overline{X}_i$ is the mean initial status for school i. While this procedure does keep schooling effects out of the estimation of Y' by using within-group regression, in a regression model it means assuming that there are no other input variables besides X or nonschool influences which are correlated with X that influence

the output and that the school effect itself is independent of initial status. Likewise, use of an analysis of covariance with input as covariates to obtain school effects is questionable because this method requires the assumption that treatments and covariate be independent, i.e., that the school effect be independent of input (Evans & Anastasio, 1968).[2] The correction for lack of validity mentioned by Harnqvist is also not appropriate to a regression model because this correction in essence asserts that within-groups initial and final status <u>should</u> be perfectly correlated, which in a regression model would mean that there are <u>no</u> other variables (explicit or implicit) which directly influence final status within groups.

E. <u>Interpretation of Regression Weights</u>

The rationale for the use of unstandardized regression coefficients has been ably discussed by Tukey (1954) and Blalock (1967). The question of interest to researchers is: Given the correctness of the model, what change in final status would be predicted from a change of one unit in some determinant of final status? For example, suppose that $Y = A + B_1 X + B_2 Z + e$ as before; how many units should we predict that Y would change if Z were changed one unit? This question is unanswerable unless we know what the association of X with Z means. If this correlation resulted from X influencing Z, then changing Z will not affect X (presuming that changing X is not the means used to change Z and that the means used do not influence X), in which case changing Z one unit should result in B_2 units of change in Y. If the correlation between X and Z resulted from Z influencing X, then a change in Z will change X which in turn will change Y, in addition to any direct influence Z has on Y. In this case a change of one unit in Z will result in B_{XZ} units change in X and since each unit change in X results in B_1 units of change in Y, this indirect or mediated effect will result in $(B_{XZ} B_1)$ units of change in Y. The total effect of one unit of change in Z would therefore result in $(B_2 + B_{XZ} B_1)$ units of change in Y. Thus the regression weight B_2 for Z represents the direct influence of Z on Y, i.e., the influence of Z on Y if X did not change (which in reality might be hard to arrange if Z influences X). If the meaning of the correlation of X and Z is obscure, then the researcher can only talk about "direct" influences, which may be a theoretical fiction since it may not be possible ever to measure this "direct" influence in isolation. If this "direct" influence is zero, one cannot assert that the variable does not influence the output since the influence may be exerted through effects on other variables which in turn influence output.

It is crucial for the researcher to remember that he is making deductions about influences given a model whose relationship to reality may be incompletely known. The fact that exact regression weights can be obtained may advance our understanding very little. Unless the research is designed to study the relationship of the model to reality, to eliminate some plausible alternative hypotheses about this relationship, the statistical computations are likely to be an exercise in futility.

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Footnotes

[1]The research reported herein was performed pursuant to Grant No. OEG-1-6-061830-0650 Project No. 6-1830 with the Office of Education, U. S. Department of Health, Education, and Welfare.

[2]Harnqvist's approach is much like ANCOVA, since $\overline{Y}_i - \overline{Y}'_i$ is equivalent to the adjusted mean for group i in ANCOVA. However, the adjusted treatment variance in ANCOVA will not equal the variance of the $(\overline{Y}_i - \overline{Y}'_i)$ unless these effects are completely uncorrelated with the covariates.

Development of a Structured Interview to Explore Vocational Decision-Making[1]

The longitudinal nature of the Study of Intellectual Growth and Vocational Development, with its repeated observations of students progressing through various school systems, is likely to throw heavy emphasis on prediction. The purpose of such predictions is not control but understanding. The relationships between an individual's status at some time and antecedent data should help us to understand how and why he got there. As the other reports in this series indicate, considerable progress has been made toward predicting such output variables as academic achievement and growth from input variables that describe a student's community, school, curriculum, family activities, abilities, and so on. Another output variable of some interest is his occupational choice--by which is often meant his verbalized preference for some occupation, or sometimes the occupation he is currently engaged in, or occasionally the reasoning and attitudes that characterize the process by which he arrives at his occupational preference or engagement.

Expressed occupational preference at most stages has been a highly unsatisfactory criterion. For one thing, it is often unstable. As long as no irrevocable commitment or costly investment in differential preparation has been made, the salience of a verbalized preference is difficult to determine. It is probably in the student's interest to remain flexible ("hang loose") as long as he can, since not only preferences but occupations themselves are likely to be unstable. Increasingly, with rapid changes in technology, workers must expect not to engage in a single permanent occupation but to plan on "serial careers." It is difficult for prediction studies to keep up with such moving targets.

Furthermore, the prediction of occupational preference or entry is often muddied because a given occupation may be perceived differently by different individuals. That is, they may choose the same occupation for "different reasons," or may choose different occupations for the "same reason." The title of an occupation is, therefore, a less useful criterion than some indication of what that occupation means to an individual. Beyond that, we are also concerned with what the process of choosing an occupation means to him. In his view, how important an element of his life is represented by occupation? What kinds and amounts of satisfaction does he hope to derive from it? What differentiations does he discern between occupations in capability of providing such satisfactions? How much control over his choice and responsibility for his choice does he appear to exercise? What role do predictive data play in his choosing?--does he consider them? is he dominated by them? what risks is he willing to take to achieve the occupational satisfactions he says he wants? What decision rules does he employ? What resources does he use? What reality tests of his perceptions and predictions has he made, or does he plan to make? How has he coped--how will he cope--with obstacles and difficulties? Has he formulated viable alternative plans? How explicit and consistent is his reasoning about these questions?

Once we have probed beneath the surface of choice to get at such underlying perceptions, attitudes, and rationales, we may find ourselves with much richer criteria of growth and vocational development. Indeed, we may be able to identify some dimensions of "vocational maturity," amongst these dynamics of decision-making, which may be more enlightening than mere occupational titles as correlates of antecedent data.

Method

To get at the individual's constructs, perceptions, attitudes, and thinking about occupational choice, we have devoted this phase of the study to developing a structured interview schedule. The questions are quite straightforward, and a small tryout group seems to have had no difficulty in understanding them and responding to them. We recognize that what an individual says about his occupational choice may involve rationalizations, perhaps related to "social desirability" response sets. We have, therefore, built a certain amount of redundancy into the interview questions. This gives us some opportunity to check on the consistency of the rationalizations, and sometimes to challenge them. Confronting individuals with apparent inconsistencies often seems to evoke particularly illuminating comments. This raises another problem which we have not yet solved, but are working on: what is the effect of the interview itself on vocational decision-making?

Obtaining subjects to be interviewed in time for this report turned out to be quite difficult. We wanted young people who were in transition from secondary school to occupational entry, without the intervening time-cushion of four years of college. That is, we wanted to start with a group for whom occupational choice would be salient, and even pressing--not an academic exercise. As a matter of convenience, our first group consisted of students at a neighboring two-year community college. Our initial interview schedule (see Form A in the appendix) required two-hour sessions with each individual. (Form B involved variations mainly in the order of presenting questions.) After using Forms A and B for eight interviews--and seeing the shadow of the impending deadline--we modified the schedule to permit small-group administration in half the time. In other words, we tried to convert the interview schedule to a written questionnaire (see Form C in the appendix). This procedure proved feasible in terms of getting most of the main questions answered, but was not nearly so satisfactory in terms of following leads, clarifying what each individual meant, and allowing him to explore freely his feelings about some of the material expressed.

Access to noncollege subjects turned out to be quite difficult. After missing connections with a community center, we eventually had to settle for administration to groups of 20 or more noncollege-bound seniors during 40-minute periods at a nearby high school. This restriction forced us to cut the schedule further; even then, many of the students were unable to complete it in the allotted time. (This was Form D, not shown; we do not recommend its use.)

On the basis of our experience with individual interviews and small-group and large-group administration, we recommend leisurely individual interviews with a small sample of the Growth and Vocational Development Study population--at least for one more phase.

Illustrative Findings and Queries

Although the main thrust of our work was instrument development, we cannot refrain from commenting on some of our "findings." Obviously, the size and composition of the group interviewed does not permit tenable generalizations. Our comments, therefore, are intended to be merely illustrative of the kinds of observations and analyses that may eventually be made. They will also raise questions which further research and development may be designed to answer. These comments, it should be emphasized, are based primarily on about eight interviews with junior college students, although we shall refer occasionally to other subjects for comparative purposes.

To make the comments easy to follow, we shall key them according to the numbers of the questions in Form A.

Q 2. The purpose here was to approach with as open-ended a question as we could the individual's own perception of an occupation of interest to him and the constructs that he used to define and differentiate it. An interviewer's check list permitted us to code the descriptive and instrumental characteristics mentioned, according to priority of mention and emphasis, extensiveness, or specificity. For example, among the descriptive characteristics we listed Activities, Entry Requirements, Level, Field, Place, Work Conditions, Outlook, Salary, Benefits, Hours, etc. Instrumental characteristics included all of the column headings for Q 13. We found that in this open-ended context the junior college students tended to focus almost exclusively on descriptions of activities. We had to go beyond probing and hinting, to ask pointed and direct questions, in order to get them to mention other characteristics.

It had been our intent to compare the constructs mentioned in response to Q 2 and 3 with constructs appearing in response to Q 7, 8, 10, 14, 15, and with the relative weights assigned to values in Q 16. Thus, we could get at the dimensions along which each student construes occupations across a number of methods--varying from open-ended to highly structured, and including as content his planned or preferred occupation, his ideal or "dream" occupation, his "nightmare" occupation, occupations with specified affects and connotations, and occupations selected to represent a variety of fields and levels. This would give us evidence of the consistency, permeability, breadth, and rigidity of his occupational constructs. The shallowness of responses to Q 2, 3, and 7 led us to change to the much more explicitly structured introductory page and Section I of Form C, with their emphasis on inductive definition of values. (Q 1 of Form A does not appear until Q 13 of Form C.)

Of incidental interest, the reply to Q 3a was usually "ask someone." Rarely was there any reference to printed materials. Q 4 and 5 responses expressed almost uniform firmness and confidence, but Q 6 responses indicated that current preference or plan had generally been of less than one year's duration. Students attributed changes most frequently to a loss of interest in the earlier preference, or to finding that the necessary educational preparation would be too difficult (the "cooling out" process), or to discovering they had enough ability to handle difficult preparation (the "heating up" process). The students indicated that they had never had much commitment to the earlier preference, in contrast with their present sense of purpose and assurance.

Q 8, 9, and 10 turned out to be extraordinarily productive. They seemed to stimulate students to specify reasons and distinctions that had not occurred to them before. (Q 9 of course depended for its effectiveness on the interviewer's insight and ingenuity in proposing alternatives that would challenge the student to reconcile value conflicts expressed or implied in his responses to Q 1-2 and to Q 8.)

The two parts of Q 11 were merged after the first interview, and this question gradually metamorphosed into the introductory page for Form C.

Q 13 is structured to permit a number of interesting analyses. One approach is to consider the central tendencies and variabilities of perceptions. If we were foolhardy enough to generalize from eight interviews (the question was deleted from Form C because it consumes a lot of time), we would venture to say there are clear central tendencies across individuals in their perceptions (or stereotypes) of the instrumentality of the 17 occupations in respect to most of the 10 value dimensions. An exception worth noting was broad dispersion on "Intrinsic Activity Interest" for almost all of the occupations. (Truck driver, however, received a consistently low rating in this column with four 1's and four 2's, and the distribution for physician, on the other hand, was negatively skewed, with five 5's, two 3's, and a 1.) This exception is precisely what one would predict of junior college students from various curricula, as these eight were.

What kinds of individual differences are related to differential perceptions? For example, do individuals who value Altruism themselves tend to see more opportunity for altruistic satisfactions in various occupations? More generally, are values and perceptions of occupations independent? Does an individual's "sense of agency" moderate the relationships? (One might hypothesize that individuals with a strong "sense of agency" tend to perceive occupations as subject to shaping.) How is SES related to perceptions of instrumentality of various occupations in respect to Income and Prestige? These questions suggest interesting hypotheses to test in later administrations.

Another approach is to examine occupational profiles, noting which occupations cluster into distinctive groups in terms of students' perceptions of their instrumentality for these values. For example, a quick glance (remember, N=8) suggests that computer programmer, draftsman, and electronic technician are perceived by these students as having quite similar instrumentalities in respect to the values listed; medical technologist and physical therapist look as if they might be perceived as similar; accountant and artist each seem to stand alone; so do truck driver, which tends to get a low rating on everything, and the steadfast culture hero, physician, which tends to get a high rating on every value but Leisure.

Still another approach is to analyze perceptions of instrumentality across occupations. For example, how prevalent is the perception of high income? (Five of the 17 occupations tend to be ranked high.) One might use this approach in retrieving occupations that are perceived as having high instrumentalities in respect to certain designated values.

Q 14 and 15 are modeled on Kelly's Role Construct Repertory (REP) test. They were designed to get at the constructs each individual uses to pair or differentiate between occupations. Although the task is specified, he is free to use any dimensions he chooses in construing similarities and differences. (Initially, we did not even limit the constructs to satisfactions and rewards.) We hoped this might allow us to identify unique value dimensions for a given individual and include them in Q 16. Performance on these two questions was quite interesting. Sharp individual differences appeared in richness, variety, and breadth of constructs used: some students sounded the same note repeatedly, in comparison after comparison. It was clear that they construed the universe of occupations along only one--or very few--dimensions; others used a number of constructs, but almost invariably used each one more than once--that is the constructs were not impermeable. Unfortunately, these items were too time-consuming. We found that we could approximate the same insights into constructs more efficiently by (essentially) reversing the task, as can be seen in Section I of Form C. While we did not have an opportunity to try the two different approaches on the same students, we believe that the Form C method is not only quicker and easier, but more productive of significant constructs.

Interviewees seemed to be quite interested in Q 16. Their scaling of values runs the gamut of possibilities. Although Q 16 was retained as Section IV of Form C, we cannot merge our cases across forms, since three additional values were named in Form C. Let us simply list the range of weights used for each value in the order in which it appears in Q 16: 0-40, 0-20, 0-20, 0-25, 0-25, 2 1/2-25, 0-15, 5-65,0-10, 0-20; for the three additional values listed in Form C, the ranges (N = 5) were 0-18, 5-15, 0-5. With a larger population, it will be interesting to compare means and standard deviations across values, and to note whether an individual's scaling of his values is related to antecedent variables (e.g., abilities, SES, activities, etc.). For example, one might want to test the hypothesis that low SES people will tend to give more weight than high SES people to Money, Security, and Working Conditions. One could also test Rodman's (1963)[1] concept of "value stretch," i.e., low SES individuals "have a wider range of values ... a stretched value system with a low degree of commitment to all the values within the range." Certainly, for the small group of junior college students interviewed, it is interesting to note that the mean weight given income was only 13.5. If this were to hold over a better sample, it might suggest that the single dimension of economic reward (as reflected in the folk consensus in various

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[1] H. Rodman, "The Lower-Class Value Stretch." Social Forces, 42, 205-215, 1963. See also Suzanne Keller, The American Lower Class Family, New York State Division of Youth, Albany, 1967.

rankings of occupations over the years) may no longer dominate. As I have suggested elsewhere (Katz, 1966)[2]

> "...differentiation by level of economic reward, although no less perceptible, may now be less salient. As the 'people's capitalism' has continued to raise the economic rewards of most occupations, economic distinctions between high-level vocations and other employment have tended to decline in utility."

Some of the noncollege-bound high school seniors, however, while generally quite vague about occupations and plans, seemed to emphasize income. As one put it, "I do know what I want out of a job is the money at the end of the week." This boy, in his scaling of values, assigned 50 points to Money, 15 to Leisure, 10 each to Security and Pleasant Working Conditions, 0 to the rest. From his comments, it was clear that he did not aspire to an extraordinarily high income: the "going rate" would satisfy him, but it was the extrinsic--not intrinsic--rewards of work that he sought. What antecedent variables are related to emphasis on intrinsic versus extrinsic values?

SES does not strike us as a good explanatory predictor of this distinction between the junior college students and the high school students. Most of the junior college interviewees we would judge to come from low SES backgrounds.

At some point, of course, correlations between values should be factored to determine the number and nature of dimensions that should be used. One might anticipate, for example, that Prestige and Autonomy would tend to be quite highly related, both in individuals' scaling of their own values and in their perceptions of the instrumentality of various occupations in respect to

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[2] M. Katz, The Name and Nature of Vocational Guidance, National Vocational Guidance Association, Washington, 1966 (multilith).

those values. So far, however, our "data" from a modest number of interviews suggest that all the distinctions between values may be worth preserving.

In discussing with students their responses to Q 16, we too seldom had time to have them re-cycle through the whole procedure, re-scaling values to allow some alternative weightings, altering instrumentality coefficients to take into account various specific possibilities and opportunities, changing probability of success decimals to allow for error terms. Certainly, there would seem to be great advantage in allowing the student to re-cycle in this way, as often as he wants, trying on different values for size, getting more and more explicit about what he wants; taking a "what-if" approach to instrumentalities of options, scrutinizing information in greater detail; playing with predictions, asking what he might do to alter them. This process should help us to gain insight into what is important to him now, and what value conflicts beset him; how he construes occupations, and how his perceptions compare to others'; what predictions he accepts or rejects, and what reality tests he uses; and finally, what decision rules he uses or adopts, and how consistently he adheres to them.

Section B of Form A and Section V of Form C try to get at coping behavior. Note that the wording of the Form C questions is a bit more specific. Q 26 (in both forms) produced surprisingly uniform answers among the junior college students. All of them seemed to feel that they had complete freedom of choice, the only constraints being their own desires and (to a lesser extent) abilities. Incidentally, this feeling held at least as strongly for the Negroes as for the whites. In the high school group, on the other hand, one boy voiced a concern that must have loomed strong for all: "How can I even talk about plans for an occupation? I'll go into military service after high school, probably go to Vietnam and get killed. What's the sense of planning?" Here, of course, is the extreme lack of sense of "agency," or of control over destiny. It stands in strong contrast to the optimistic assurance and self-reliance displayed by the junior college students. It will be of interest, then, to ascertain the relationships between such attitudes and antecedent variables.

Responses to Q 27 (Form A) were surprisingly uniform. Without considerable prodding (e.g., "What would you do if you didn't get a job that way?"), nothing but direct application to possible employers was mentioned. There seemed to be little awareness of or faith in other resources for job placement. Most of the junior college students displayed complete confidence in getting an appropriate job once educational requirements had been met. It did not occur to them that there might be difficulties, or that they might have to compromise on some other kind of job. Thus, affirmative responses to Q 27b were made reluctantly--only on condition that no job was available in the planned field after many months of looking. And then the alternative would be taken only on an interim basis.

In response to Q 28 (Section C of Form A, or see Q 28 of Form C), the junior college students tended to rate work as a "most important" part of life, or at least a "source of major satisfactions." The noncollege-bound high school seniors, on the other hand, tended to rank satisfactions from recreation, religion, and family life higher than work satisfactions (the question was asked in somewhat different form; so the responses are not strictly comparable). Here, again, we may want to note in future studies whether the importance of work varies with SES, abilities, education, and so on. Notwithstanding the junior college students' response to Q 28, most of them responded negatively to Q 30. That is, work might be a more important source of satisfaction to them than recreation, but they would not necessarily forgo recreation. Furthermore, they did not really believe there was any place that offered good occupational opportunities that did not include suitable avocational opportunities.

Q 32 occasioned several comments to the effect that the interview had "extended my ideas about what to look for in an occupation," "made me think about why I was making my choice," and so on. It seemed to have a particularly strong impact on one student who had appeared especially firm and specific in his plan to become a chemical engineer. Working as a draftsman after his graduation from high school (where he said he had been "pushed into" a vocational curriculum by his guidance counselor), he had had a particularly good opportunity to observe chemical engineers at work and had an unusually thorough knowledge of their work activities. His perceptions (in the comparisons of occupations) seemed fixed almost exclusively on one construct: whether an occupation offered any outlet for scientific interest and inventiveness, or not. The sole deviation involved a discrimination between occupations in terms of altruism--opportunity to help others. The systematic exploration and examination that accompanied his scaling of values brought out more explicit recognition of Altruism as a value of some importance to him. With this discovery, other values of which he had not been fully aware also came into focus as quite important to him: notably Variety and Autonomy. In responding to Q 32, he said that the interview had "brought to the surface values I've held but never recognized. That shakes me. ...If I had two lives to lead, for one of them I'd go into the Peace Corps as soon as I finished college. Maybe then I'd try to become a high school teacher or counselor, or a community worker. But I came up the hard way. There are things I see now I want to do, but I can't do them until I get firm ground under me. I'm still determined to become a chemical engineer. Not like a machine, though, but like a person."

This excerpt points up the problem of possible interview effect which we mentioned earlier: can one measure the status of an individual's vocational decision-making without influencing it? Probably not. If the influence were uniform, comparisons between individuals might not be unduly upset. But a differential influence, varying from one person to another, might confound some of the comparisons and analyses. Perhaps we may comfort ourselves by assuming that people encounter many common experiences that have differential effects, and this is merely one of such an unknown number. The differential effect may indeed be part of the substance of what we are trying to investigate. At any rate, we hope to experiment with other procedures, including the further development and administration of a role-playing exercise, as alternative means of getting at vocational decision-making styles and vocational maturity.

Finally, let us point out that in conducting this walking tour through the interview questions and trying to illustrate the kinds of generalizations and analyses that may be derived from the responses, we have neglected to convey the flavor of any single interview. We would like to amend this deficiency, in part, by quoting a few bits and pieces from the interview with a mature student, who had served a hitch with the Air Force, had worked in a steel mill, and then had enrolled in a two-year community college to get the education that he felt would open a technical or business occupation to him. Initially, a major concern had been to choose an occupation that would pay well. "The money was good at the steel mill," he said, "but the work was hazardous and dirty." He had expected to make at least as much money with better working conditions. But long talks with his history instructor, along with his increasingly sharp awareness of "societal conditions," made him change his mind. He now wanted to become a high school teacher of mathematics. His "ideal" (Q 8) would be to establish and head a school for slow learners, "to make them enjoy coming to school and teach them to better themselves." When asked (Q 9) why, in view of his desire to change social and economic conditions, he hadn't decided to study law and enter politics, he said he had no wish to govern or control people, "but to teach them to help themselves. I came from the slums myself. I can teach those kids not to give up. I would take lower pay to teach in a slum school--to lift those students, help them become useful and not just die by the wayside." Why hadn't he chosen the ministry? "Religion is separate from real life." He perceived high school teacher (Q 13) as offering very high satisfaction (5) in respect to all values except Income, Security, Variety, and Leisure. He used a wealth of constructs in Q 14 and 15, often three--once even four--for a single sort. In his scaling of values (Q 16), Altruism--as would be expected--was highest with 25, Security 15, Income, Prestige, Autonomy, and Leadership 10 each, Intrinsic Activity Interest 8, Variety and Pleasant Working Conditions 5 each, Leisure 2. (Apropos a previously mentioned hypothesis concerning independence of values and perceptions, it may be interesting to note in Q 13 the coefficients he used for instrumentality of 16 occupations in respect to Altruism: 2, 1, 1, 3, 3, 3, 3, 5, 5, 4, 5, 5, 5, 5, 3, 3, respectively.) We can anchor in behavior some of the weights he used in scaling his values. For example, in respect to autonomy, the importance of being free to make his own decisions, he told that when he had decided to quit his high-paying steel work in order to go to school, "My wife said no, I said yes, and she put me out." Applying this to teaching, he said, "You can't teach if the reins are too tight. The teacher must be free to express himself and to be himself. He has to teach the way he feels. He has to be free to make his own decisions." If he were unable to find a teaching job, and received a good offer in business (Q 27b), he would take it "only till a teaching job opened up." How important a part of his life is work (Q 28)? "It's the only thing to live for. . . .This is a working society; those who don't work are downing society."

How much of this could we have predicted from antecedent data? How much different would his responses have been if we had interviewed him before his long talks with his history instructor? How much difference will there be a year from now? What predictions can we make from our present glimpse into his perceptions, constructs, reasoning, attitudes, and life history? How can we study vocational development except through recurrent probes of this kind over years of change? By how much would vocational guidance be enriched if such studies were continually carried on?

Footnote

[1]The research reported herein was performed pursuant to Grant No. OEG-1-6-961830 Project No. 6-1830 with the Office of Education, U. S. Department of Health, Education, and Welfare.

Appendix

Vocational Development Interview Schedule--FORM A

1) Interviewer introduces himself (herself), then defines the project: This interview is part of a research study of vocational development. It is supported by the U. S. Office of Education. We want to find out how community college students (high school graduates) look at occupations and make decisions about their careers. By improving our knowledge and understanding, we eventually hope to improve vocational guidance services.

2) Please print your name and address on this card, so our accounting office will know where to send your check.

3) Whatever you say will be considered completely confidential. With your permission, I would like to use this tape recorder so that I can analyze the questions and answers back in my office. (This will help me make some of the questions clearer in later interviews.) But there will be no identification of individuals in our research report. (Start tape recorder.)

I don't think you will find any of the questions too personal, or offensive in any way. But you should feel free to refuse to answer any question for any reason at all.

SECTION A--Occupational Plans and Perceptions

1. Name the occupation(s) you plan to enter (are considering).

2. I don't know much about (1). Can you tell me about it? [Check list "A"]

3. What information would you like to have about this occupation that you don't have now? [Check list "A"]

   a) (for each item mentioned) Where do you think you could get this information?

4. How firm is your (choice, plan, preference)? [Strong, Moderate, Weak]

   a) What might make you change your choice, plan...?

5. How confident are you that you will actually enter this occupation? [Strong, Moderate, Weak]

6. Since when (How long) have you held this (choice, plan, preference)?

   a) what change? (previous choice)

   b) any change since entering grade 11? Can you remember what it was then? Why did you change? [Probes: additional knowledge about self, change in self-concept, additional knowledge about occupations?]

[Cf. w/BEQ for validity of retrospection, consciousness of change]

7. Tell me more about why you chose (1). What appeals to you most? What do you expect to like about it most? What do you expect to like least? What changes would you make in it, if you could, to make it more appealing or satisfying? [Check list "A"]

8. Now sit back and turn your imagination loose. Try to describe, as fully as you can, what you would regard as an ideal or "dream" occupation. It can be a real occupation, or one you invent. [Use check list "A" to compare differences. Probe to make distinctions as explicit as possible, e.g., "Then a chance to travel more than 1 is important to you?"]

   [relate congruence between ideal and planned to antecedent variables: abilities, activities, earlier plans, SES, curriculum, school and community ... BEQ, Warren "B" & "C"]

9. In view of what you've said about an ideal occupation, why didn't you decide to become a ____________ instead of (1)? [Interviewer must choose occupation that resembles 8 in at least some salient features.]

10. Now reverse your field and think of the worst occupation you can. If the other was a "dream," this would be a "nightmare." [Check list "A" again]

11. Your values refer to what you want and what you feel is important to you. For example, in choosing an occupation, you might consider values like these (define or explain, as necessary):

- income - money and related benefits (insurance, pension)
- prestige - looked up to by most people
- autonomy - free to make decisions, do things own way; independence
- security - steady work, not likely to be fired or laid off
- altruism - help other people
- variety, change - do different things
- leadership, responsibility - direct or supervise others, be in charge
- intrinsic activity interest - find the work itself interesting
- leisure - a lot of time off
- pleasant working conditions - hours, surroundings, people, location

Recall "critical incident" in life that came out well (i.e., gave payoff) in respect to each of these values--an occasion when you

did a job for which you were paid well ______________________

gained a lot of prestige or recognition, won respect of others ______________________

felt good about having freedom to make decisions ______________________

felt good about being safe and secure in a situation ______________________

got a kick out of helping someone else ______________________

found pleasure in variety or change (surprises) ______________________

exercised leadership or responsibility for others ______________________

engaged in a work-like activity that you found really interesting ______________________

enjoyed a lot of leisure ______________________

experienced really pleasant conditions for work ______________________

[Use to clarify his perception of each value dimension. Quality of satisfaction ... opportunity for experience at first hand ... relate to scaling, 16, & REP]

12. Which are most important to you in choosing your occupation: your abilities, interests, values? (explain and define as necessary). What does each tell you?

[Underline to show: recognition of abilities as indicating chances of success, values and interests relevant to satisfaction]

13. Perceptions of Instrumentality and Global Ratings of Desirability of 17 Occupations

How much satisfaction is each of the following occupations likely to offer in respect to each value? Rate all the occupations for each value. Use this scale:

1 = likely to offer very little or no satisfaction in respect to this value (the lowest 10% of all occupations).

2 = likely to offer some satisfaction in respect to this value (next 20% of all occupations).

3 = likely to offer medium satisfaction in respect to this value (middle 40%).

4 = likely to offer quite high satisfaction in respect to this value (next to highest 20%).

5 = likely to offer very high satisfaction in respect to this value (highest 10%).

[Substitute "Other" value from "A" if appropriate.]

Occupation	Values: Income	Prestige	Autonomy	Altruism	Leadership and Responsibility	Security	Variety, change (surprise)	Intrinsic activity interest	Leisure	Pleasant working conditions	In this column rate each occupation 1-5 to show its overall appeal to you
accountant											
artist											
automobile salesman											
clothing store owner											
computer programmer											
draftsman											
electronic technician											
high school teacher											
medical technologist											
newspaper reporter											
physical therapist											
physician											
policeman											
recreation leader (Boys Club)											
surveyor											
truck driver											
own occupation choice not listed above											

14. Write under the letter (A...E) at the top of each column the name of the following occupation: (A) your ideal occupation; (B) the occupation you are most likely to enter; (C) your father's (or other family member's) occupation; (D) your best friend's (same age and sex) occupational choice; (E) an occupation that you think is desirable in some ways but that you would not want to enter. Now think about the three occupations represented by circles in the row marked Sort #1. Of these three, which two seem to offer satisfactions and rewards that are more like each other than the satisfactions and rewards offered by the third one? Mark a + in the circle for each of the two that are more alike, and a - in the circle for the one that seems different from the other two. Describe the difference in a few words--that is, what satisfactions and rewards do the two marked + both offer to a greater extent than the one marked - ?

Sort #	A	B	C	D	E	Construct	Contrast
1	○		○		○		
2	○	○		○			
3		○	○	○			
4	○	○			○		
5			○	○	○		
6	○	○	○				
7	○			○	○		
8		○	○		○		
9	○		○	○			
10		○		○	○		

15. List in the columns at the top the names of the five occupations that had the highest appeal for you (last column of Q 13), then make the same kind of comparison for each row as in Q 14.

Sort #						Construct	Contrast
1	O		O		O		
2	O	O		O			
3		O	O	O			
4	O	O			O		
5			O	O	O		
6	O	O	O				
7	O			O	O		
8		O	O		O		
9	O		O	O			
10		O		O	O		

(According to which elements in Check List "A" does he distinguish?)

16. Values

Dimension	Magnitude *	Importance (Sum = 100)	Occupations (Student lists 5 from Q15)									
			Coefficient	Product	Coefficient	Product	Coefficient	Product	Coefficient	Product	Coefficient	Product
Income												
Prestige												
Autonomy												
Security												
Altruism												
Variety												
Leadership												
Intrinsic Activity Interest												
Leisure												
Pleasant conditions												

Sum of products:

Probability of success:

Index of Combined Utility and Probability:

(* Between threshold and highest expectation: e.g., between greatest income you could expect in occupation 6 years from now and barely acceptable)

Ask yourself the importance of each of the values (listed above) in your choice of an occupation. Which are most important? Which least? Which of medium importance? Suppose you had 100 points to distribute among these 10 values. In the column under "Importance" allocate the 100 points in any way you want--one value can receive 2 or 3 times as much as another but the sum must be 100.

Then under the column headed "Coefficient" for each occupation, insert the number, 1-5, that you used previously (Q13). This shows how much opportunity you think there is in each occupation to find the satisfaction associated with each value. Multiply this coefficient by the number you used to designate "importance" of each value, and enter the product under the heading, "Product." Sum the products for each occupation.

Now, what do you think your chances are of getting into each occupation--i.e., completing the necessary education and making a start? Express these probabilities as a decimal--e.g., .90 to suggest that you have a 90% probability of making it, .50 to suggest 50% chance, .25 to suggest 25% chance, etc. Then multiply this decimal by the sum above it. Look at the resulting Index for each occupation. Does this come out in the order of your preferences for these 5 occupations? Explain discrepancies. (Re-cycle on extra page if student wishes to do so, changing magnitudes, values, instrumentality ratings, or probabilities.) 304

SECTION B--Coping Behavior

17. Present activities e.g., job, junior college course, apprentice-training ... (specify e.g., what course are you now taking at MCCC?)

18. General satisfaction with present (course) (job)? [High, medium, low]

19. What do you (find most interesting and satisfying about) (like most about) it?

20. What do you like least about it?

21. Which of these (satisfactions and dissatisfactions) did you (anticipate) (predict correctly)? [outcome of previous decision-making]

22. What surprised you most?

23. How does present activity (e.g., course) tie in with occupational choice (plan)?

[Underline: Directly helping--right on the road; indirectly useful; irrelevant--but necessary; delaying or hindering]

[relate to optimism-pessimism about future, confidence]

a) Are you satisfied with your progress under the circumstances? [High, Moderate, Low, Negative]

b) What would you (have done) do differently if you could do it over again? [Specify--e.g., go to another school, take a different course...]

24. How does present activity tie in with previous decisions? [Specify--e.g., high school curriculum, previous part-time work...]

[Underline: Appropriate--Irrelevant--Hindrance]

25. What people would you say have influenced you most in making your occupational (or related) decisions?

a) If you are still in doubt about choice, with whom would you most want to discuss your choices and plans? Why do you choose him? Describe the characteristics that make him seem most helpful to you.

[Underline:
Knowledge of individual,
Knowledge of specific occupations
Knowledge of occupations generally affect--e.g., warm, kind, understanding--professional role]

26. What limits do you think there are on your freedom of choice? For example, what occupations would you regard as closed to you even if you wanted to enter them? Why?

[Underline:
Individual vs. social-cultural,
Internal vs. external constraints]

27. How do you expect to get your first job in (1)?

a) What will you do if you don't get a job in (1) after --- months?

b) Suppose while you are still looking, someone offered you a good job as___________________________ (occupation contrasting with planned one). Would you take it?

[Underline:
Direct application to possible employer

Placement office
SES
ADS
Family, friends
Counseling Agency
Training Facility
Military Service]

[Estimate sense of agency--Active or Passive]

[Commitment to occupation preferred--Cf. Warren "B"]

SECTION C--Degree of Commitment to Vocation and Avocation

3. How important a part of your life do you think work is or should be? --compared, say, with recreation, religion, marriage-home-family...

[Most important, source of major satisfactions, or other things more important?]

9. What are (do you expect to be) some of your main (spare-time) (avocational) activities? What are the main satisfactions you expect to get from each one?

[kind
level
competitive, coop., or solitary community service vs. hedonism
degree of commitment or involvement (Warren "D")]

[Relationship between vocation and avocation: congruent or complementary? (e.g., high-commitment occupation and high-commitment avocation, low-low, high-low, or low-high?)]

0. If you were offered a very attractive vocational opportunity (specify) in some place where you could not engage in any of your main avocational activities (specify)--would you take it?

31. Is there anything else you would like to say about your vocational decisions? Any second thoughts, or after-thoughts?

32. Has this interview influenced your thinking at all? Given you ideas for new ways of looking at occupations, or new ideas about how to make vocational decisions?

Vocational Development Interview Schedule--FORM C

Introduction

I am going to name some values that people might consider important in choosing an occupation. See if you can name an occupation that offers a strong opportunity for satisfaction of each value. Then see if you can name another occupation that offers very weak opportunity to satisfy that value. Try to name a different occupation each time--avoid repetition.

Value	Strong	Weak
Money		
Prestige		
Freedom to make decisions		
Helping others		
Security, steady work		
Variety, change, nonroutine work		
Leadership, responsibility for others, supervision		
Interest in the activities themselves		
Leisure		
Working conditions		
Creativity, expression of ideas		
Sense of accomplishment, pride in work		
Privacy		

SECTION I

The questions in Section I ask that you name two occupations that appeal to you in some important way (such as the values we have just discussed) and one that does not appeal to you in that way.

Example:	
Name two occupations that appeal to you in some important way:	a author
	b researcher
Name one occupation that does not appeal to you in that way:	c banker

After naming the occupations contrast the first two (these that appeal to you) with the third (the one that does not appeal to you). In other words, indicate what it is that appeals to you or that you like about the first two that doesn't appear in the third.

Example:
Contrast ideas, creativity

When naming the occupations and making the contrasts try to avoid naming specific job activities and think in terms of those things that are really important to you.

1. Name two occupations that appeal to you in some important way: a____________

   Name one occupation that does not appeal to you in that way: b____________

   What do you like about the first 2 that you don't like about the 3rd? c____________

   contrast________________________

2. Name two more that appeal to you in some <u>other</u> important way: d____________

   e____________

   Again, name one that does not appeal to you in that way: f____________

   Again, explain the difference:

   contrast________________________

3. Name two more that appeal to you in some <u>other</u> important way: g____________

   h____________

   Again, name one that does not appeal to you in that way: i____________

   Again, explain the difference:

   contrast________________________

4. Name two occupations that appeal to you in some other important way: j______ k______

Name one that does not appeal to you in that way: l______

Explain the difference:

contrast______

5. Name two occupations that appeal to you in some other important way: m______ n______

Name one that does not appeal to you in that way: o______

Explain the difference:

contrast______

SECTION II

Now look back at each of the occupations that you named in Section I as ones that appeal to you (occupations a and b in question 1, d and e in question 2, etc.) and indicate some way in which each does not appeal to you.

> Example:
>
> Indicate some important things you don't like about each of the occupations named in Section I a, b, d, e, etc.
>
> a insecurity, can't be sure of income, may run out of ideas
>
> b long hours

6. Indicate some important things you don't like about each of the occupations named in Section I a, b, d, e, etc.

a______

b______

d______

e______

g______

h______

j______

k______

m______

n______

Once again look back at Section I but this time to the occupations that did not appeal to you (occupation c in question 1, f in question 2, etc.). Indicate some important things that you do like about each of these occupations.

> Example:
>
> Indicate some important things that you do like about each of the occupations named in Section I c, f, i, etc.
>
> c Good hours, prestige, security

7. Indicate some important things that you do like about each of the occupations named in Section I c, f, i, etc.

   c____________________

   f____________________

   i____________________

   l____________________

   o____________________

SECTION III

8. Describe your ideal or "dream" occupation. The occupation does not have to be one that actually exists. It can be one that you make up by combining the best parts of occupations that do appeal to you. Briefly describe both the occupation and the main satisfactions you would get out of your work.

9. Now go in the opposite direction and describe your worst or "nightmare" occupation--one that would offer the fewest satisfactions.

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SECTION IV

10. Listed below are some satisfactions or values that people might consider important in choosing an occupation. Ask yourself the importance of each of these values in your choice of an occupation. Which do you consider most important? Which least?

Suppose you had 100 points to distribute among these values. Distribute these 100 points in a manner that reflects the relative importance of each value in choosing an occupation. One value can receive 2 or 3 times as much as another, but the sum must be 100.

Example:

Money	15
Prestige	20
Freedom to make decisions	5
Helping others	0
Security, steady work	0
Variety, change, nonroutine work	10
Leadership, responsibility for others, supervision	5
Interest in the activities themselves	25
Leisure	5
Working conditions	0
Creativity, expression of ideas	10
Sense of accomplishment, pride in work	5
Privacy	0
Total	100

Notice that while some of the values received 0 points and others received varying numbers of points the total number of points sum to 100.

Now you distribute the 100 points in a manner that best reflects the relative importance you give each value in choosing an occupation. After you have done so, look over your point distribution once again. Make sure that the points allotted to each of the values truly reveal how important you feel each is in selecting an occupation.

Money . . . . ______

Prestige. . . . . ______

Freedom to make decisions . . . . ______

Helping others. . . . . ______

Security, steady work . . . . ______

Variety, change, nonroutine work. . . . . ______

Leadership, responsibility for others, supervision. . . . . ______

Interest in the activities themselves . . . . ______

Leisure . . . . ______

Working conditions. . . . . ______

Creativity, expression of ideas . . . . ______

Sense of accomplishment, pride in work. . . . . ______

Privacy . . . . ______

11. Complete the table below. First, write in the names of the occupations called for in each of the five columns. Second, use a scale from 1 to 5 where

low ↑ 1 = likely to offer very little or no satisfaction with respect to this value

2 = likely to offer some satisfaction in respect to this value

3 = likely to offer medium satisfaction in respect to this value

4 = likely to offer quite high satisfaction in respect to this value

high ↓ 5 = likely to offer very high satisfaction in respect to this value

to indicate how much opportunity you think there is in each occupation named to find the satisfaction associated with each of the values listed at the left.

Treat the values one at a time and go across occupations, that is, start with income and rate each of the five occupations on this value. Proceed down the list of values.

Complete this table (questions 11 & 12)

OCCUPATIONS → / ↓ VALUES	Write in the occupation you expect to enter	Write in the occupation named in Section Ia	Write in the occupation named in Section Ib	Write in the occupation named in Section Ic	Write in the occupation of physician	Write in the occupation of truck driver
Money						
Prestige						
Freedom						
Helping						
Security						
Variety						
Leadership						
Interest						
Leisure						
Working						
Creativity						
Sense						
Privacy						
Probability of Success						

12. In terms of your own abilities, what do you think are the chances of getting into each of these occupations? In other words, what do you think is the likelihood that you could successfully complete the necessary education and make a start in each of these occupations? Express this likelihood in terms of a percent--for example, 90% indicates that you feel that there is a 90% probability that you could enter an occupation. Enter these probabilities on the table (last row labeled Probability of Success).

SECTION V

13. What occupation do you expect to enter?____________________

14. When did you first decide that you wanted to enter the occupation named in question 13?____________________

15. Before that time, what occupation did you prefer?____________________

16. Why did you change?____________________

17. What course are you now taking in school?____________________

18. In view of your plans, do you think this was the best choice you could have made?____________________

19. What high school curriculum did you take?____________________

20. What would you do differently if you could do it over again?

    In high school____________________

    In college____________________

21. What people would you say have influenced you most in making your occupational (or related) decisions?____________________

22. If you are (or were) in doubt about an occupational choice, with whom would you most want to discuss your choices and plans?________

    ____

23. Why did you choose this person? Describe the characteristics that make him seem most helpful to you.____________________

    ____

24. How do you expect to get your first job?____________________

    ____

25. If you don't get a job in the occupation of your first choice, say after several months, what kind of job will you try for?__________

____

26. What limits do you think there are on your freedom of choice? For example, what occupations would you regard as closed to you even if you wanted to enter them? Why?__________

____

27. How important a part of your life do you think work is or should be? --compared, say, with recreation, religion, marriage-home-family ... (check one)

_____ most important

_____ major importance

_____ less important

28. What do you expect to be some of your main spare-time activities? What are the main satisfactions you expect to get from each one?

Activity	Satisfaction
__________	__________
__________	__________
__________	__________

29. If you were offered a very attractive vocational opportunity in some place where you could not engage in any of your main spare-time activities, would you take it?__________

30. Is there anything else you would like to say about your vocational decisions? Any second thoughts, or afterthoughts?__________

____

____

31. Has this exercise influenced your thinking at all? What new ways of looking at occupations, or new ideas about how to make vocational decisions, has it given you?__________

____

____

Simulating the Process by which Certain Students F ɔome

Identified with a Particular High School Course

American Psychological Association Convention

New York City, New York

September 4, 1966

Thomas L. Hilton

Educational Testing Service

The rather awkward and circuitous title of this paper reflects some preliminary thoughts about individual educational development, the offering of which is the main purpose of this paper. First, however, the objectives of a research effort under way at ETS will be described along with some observations from our initial investigation of the development of some students in one school. The investigation is one of several being conducted as part of a project entitled "A Study of Intellectual Growth and Vocational Development" being conducted at ETS under a grant from the Division of Adult and Vocational Research of the Office of Education.

Of the several objectives of this study which is probably better described as a program of research rather than a study the one most relevant to the present paper is that of investigating the interaction over time of an individual's stated vocational plans, his abilities and achievement, environmental influences, and subsequent occupation. The initial goal of this study is to gain an understanding of this interaction.

What is the relation between individual characteristics and vocational plans? Do junior high school students (who happen to be of major interest to our study at the moment) who possess a certain set of characteristics tend to have one kind of vocational plans and thus, almost inevitably become involved in certain educational programs? Which aspects of the students' environment have the greatest influence on this involvement? What effect do these aspects of the students' secondary school education have on his subsequent educational or vocational involvement? And finally, in what way does a student's educational development affect his intellectual development and vice versa?

The present study grew out of a longitudinal study of academic growth which has been under way at ETS since 1960 under the joint sponsorship of the College Entrance Examination Board and ETS. A major working hypothesis of that study is that academic growth as measured at regular intervals by the Sequential Tests of Educational Progress is not independent of the educational program which the student is identified with. In other words, not only does a student's academic ability influence what curriculum he becomes involved in, but it also works the other way around: the growth of the student's academic ability is influenced by what curriculum he is involved in.

The long range goal of this study is to learn something about how secondary school education should be structured to optimize the vocational-educational development of young people and how secondary school educators, including teachers, counselors, and administrative staff members, can intervene in the process to optimize the development. It may be, for example, that permitting certain students to be enrolled in the college preparatory program simply is not in their best interest in terms of their probable vocational involvement. At this point, however, it is equally conceivable that being enrolled in certain educational programs is so detrimental to the intellectual growth of the students concerned that a drastic restructuring of secondary school education is called for. Let me emphasize that I am merely saying that these two possibilities are conceivable. Although extensive research has been conducted in this general area, to the best of my knowledge the kind of evidence which is necessary to reject or accept these possibilities simply is not available at present.

Our approach to the problem of explicating the developmental process is a combination of what Allport labeled the nomothetic and idiographic approach, although we have somewhat reversed the usual use of these approaches. In line with the nomothetic tradition we are examining the early characteristics of students who later graduated from various high school academic programs. By "early characteristics" I mean the students' abilities, achievements, and school and non-school experiences as measured by tests and questionnaires given at the seventh grade level. We also have the opportunity of looking at the abilities of one sample as measured at the fifth grade level. Indeed, as I will mention shortly, there are some indications that the fifth grade is not too early to look for the antecedents of certain educational outcomes which materialize at the eleventh or the twelfth grade.

In the idiographic tradition we are using computer language to specify decision roles which, given certain information about the students and their environment, will generate predictions which accurately match the educational development of the students. Whether this is correctly referred to as simulation is debatable. We find it convenient to do so.

Earlier I referred to our use of the idiographic and nomothetic approaches as a reversal of the usual procedures. Usually case studies, i.e., intensive investigation of single individuals and the manifold forces impinging on the individual, have been conducted as hypothesis-seeking procedures with nomothetic studies being used for the purposes of hypothesis-testing. In other words, the researcher examines a few cases in great detail in order to arrive at some hypothesis about the dynamics of the situation, and then turns to larger samples to test the hypotheses by conventional statistical methods. In part we are reversing the procedure by examining the profile of test and questionnaire scores of students classified in certain ways. Hypotheses are proposed to account for significant differences. These hypotheses are then translated into decision roles which are tested by examining individual cases. Thus the acid test of a hypothesis is whether it can accurately predict the educational development of individuals studied one at a time.

The only way in which we depart from this somewhat overdrawn encapsulation of our approach is that the hypotheses suggested by the large sample nomethetic findings are supplemented by hypotheses suggested by intensive examination of single schools. To be specific, one of the 25 high schools participating in the Growth Study has been studied in substantial detail. The guidance staff has provided us with step by step descriptions of the educational development of the students as they perceive it and attempt to influence it. School publications have been examined for leads concerning both the formal and informal structure of the school and individual cases have been examined, primarily as a way of checking whether the system as perceived by the guidance staff is the same system as that experienced by the students. Since the students were absent from the school during this last two and one-half months we have been observing it, we have not had the opportunity to interview any students, which is a shortcoming we expect to correct this fall. We also expect to interview members of the teaching and administrative staff.

As one way of introducing some of our observations to date, let me now return to the title of this paper, which was "Simulating the Process by which Certain Students Become Identified with a Particular High School Course." The title is more significant in what it doesn't say than in what it does say.

The first omission from the title is any reference to student decision-making. This deliberate omission is primarily to avoid any implication that decision-making on the part of the student plays a dominant role in his educational development judging from the counselor's description of the educational development of individual students. We also found in our examination of students' cumulative records that it was a rare student who assumes primary responsibility for his educational development--who makes deliberate, well thought-out decisions at this level. This observation comes as no surprise to most of you here. This state of affairs, incidentally, is regretted by the counselors we have talked to. It is not by their choice that most students are passive agents of their own progress.

Note that these are qualified generalizations which I am offering. I refer to "most students" or "rare students." There are exceptions. We do find evidence of some students who have adopted a career plan and have aggressively set out to implement it. Our impression, to date, is that this is the unusual case.

The second omission from the title is any reference to the counselor's decision-making or to the guidance process. This omission reflects a desire not to give the impression that the guidance counselor is the only person involved in the educational planning of the student or that educational plans are arrived at only through guidance. Just how influential one regards the guidance staff to be is in part a semantic problem. If the counselor sees that a student's ability test scores are lower than those normally expected of students in a college preparatory program and accordingly recommends that the student not enroll in that program, is it the student's ability or is it the counselor's insight which determines the course of the student's career. This is reminiscent of the question of whether it is the pressure within the balloon or the prick of the pin which causes the balloon to burst. In any case it is clear that there are many students whose educational careers progress with minimal intervention on the part of the guidance staff. The role of the staff for these students is primarily one of maintaining a system--of administering tests to the students and categorizing the students in certain ways in terms of the tests' results, of counting the number of subjects the student has failed, and informing the student that he must repeat the grade if the number exceeds some maximum.

For many students, perhaps a majority, the development of their career through junior and senior high school is a matter of following pathways without choice points. There may be branches in the path, but which branch to take is determined by the time the student gets there. Thus, the process by which students become identified with particular courses depends more on an elaborate system of rules than on problem-solving or decision-making efforts of individuals.

Having said this, let me hasten to add that I am not condoning or condemning the system at this point. Our present effort is to describe it.

Our initial efforts to develop flow charts describing the development of each student's educational program suggests some observations which I will relate in closing. First, as anyone who has attempted this knows, they rapidly become very complex. Repeatedly we thought we understood the rules by which action is determined at critical points only to find that we had to return to the school to get information about what is done under certain conditions, what facts are relevant, how much weight is attached to certain information, in what order the information is considered, and what is done when incompatible alternatives are encountered. What has been said about computer simulation may indeed be true, namely, that its principle value is that it forces one to be very explicit and precise in describing the process to be simulated.

A second impression we have gained from our preliminary efforts concerns the extent to which major educational outcomes in the students' life tend to be determined by one or more seemingly minor decisions. For example, a decision is made not to assign a particular student to the seventh grade accelerated math group because, though able, the student has not demonstrated the diligence required of that group. The student may perform moderately well as a seventh grader but he is not sufficiently outstanding to justify his upgrading to the eighth grade accelerated group, which has used a different text book throughout the seventh grade. In the eighth grade he may perform moderately well but by the end of the eighth grade, the accelerated group has advanced so far beyond the other students that only a student outstanding in ability and drive could hope to catch up with the other members of the group.

One last observation concerns the pervasive role of student ability as a determinant of the student's educational development as perceived by the teaching and guidance staff. It appears that our greatest problems as simulators of the educational process in this particular school lie in determining what combinations of events cause the basic sorting of students in terms of their perceived ability to be over-ruled. Other things being equal students are assigned to sections at a particular level on the basis of their measured ability and they remain at that level until some combination of circumstances results in their being moved to the next higher or next lower level section.

In closing let me repeat that these remarks are descriptive not normative. Although we have been tremendously impressed by conscientiousness and competence of the guidance staff we have observed, these remarks should not be interprete as supporting or rejecting the guidance process in the school. Also keep in mind that so far we have an N of one.

In this particular school what might be called ability sorting plays a major role. Until, however, we find that this model provides better predictions than alternative models and that it fits at an appreciable number of schools we will not promote it as an acceptable description of the process in question.

ED 056 064

PRINT NAME ______________________________ ANSWER SHEET NUMBER _ _ _ _ _
(Last) (First) (Middle Initial)

SCHOOL ______________________________ CITY ______________________________

GRADE 11

BACKGROUND AND EXPERIENCE QUESTIONNAIRE

This booklet contains questions about some of your activities during the past two years. The purpose of the questions is to find out if the things you have done outside the classroom affect what you learn inside the classroom.

Your answers will not be graded by your teachers or school. However, they will be analyzed for scientific purposes by Educational Testing Service and the results may be used to help other high school students. Therefore, it is important that you answer every question as accurately as you can.

Write your name, answer sheet number, school, and city at the top of this page. Be sure these pieces of information are identical to those you fill out on your answer sheet. Pay special attention to the accuracy of your number above. It is the way the answers you write in your test booklet will be matched to the answers you mark on your answer sheet.

Here are the things to keep in mind when you fill out this questionnaire:

1. Answer the questions in terms of what you have actually done during grades 9 and 10—that is, since October 1963.
2. Answer each question as accurately as you can.
3. Answer every question (unless you are specifically told to skip).
4. Do not count things you have done as part of your school assignments.
5. Some of the questions have blanks in the test booklet and stars (*) after some of the choices. If the answer you mark has a star, be sure to fill in the blank.
6. Mark all of your choices—A, B, C, etc.—on the answer sheet. Put all of your write-in answers in the test booklet.

1. Are you a boy or a girl? (Mark A or B on your answer sheet.)

A Boy
B Girl

2. What grade are you now in?

A 10
B 11

3. What grade were you in last year?

A 9
B 10
C 11

4. Have your changed your home address since October 1963?

A No
B Yes

5. Have you changed schools since October 1963?

A No
B Yes

How much time each week, on the average, have you spent watching each of the following kinds of TELEVISION programs—during grades 9 and 10? Do not include programs that were part of your school work. Do not include TV watching during school vacations.

6. Detective stories or mysteries

A Very little or none
B About 30 minutes a week
C Between 30 and 60 minutes a week
D Over 60 minutes a week

7. Westerns and adventure stories

A Very little or none
B About 30 minutes a week
C Between 30 and 60 minutes a week
D Over 60 minutes a week

8. Variety programs (for example, Ed Sullivan)

A Very little or none
B About 30 minutes a week
C Between 30 and 60 minutes a week
D Over 60 minutes a week

9. Comedy

A Very little or none
B About 30 minutes a week
C Between 30 and 60 minutes a week
D Over 60 minutes a week

10. Teen-age music and dancing

A Very little or none
B About 30 minutes a week
C Between 30 and 60 minutes a week
D Over 60 minutes a week

11. Serious drama, music, or "specials"

A Very little or none
B About 30 minutes a week
C Between 30 and 60 minutes a week
D Over 60 minutes a week

12. Documentaries or coverage of special events

A Very little or none
B About 30 minutes a week
C Between 30 and 60 minutes a week
D Over 60 minutes a week

13. Educational courses, programs, or talks

A Very little or none
B About 30 minutes a week
C Between 30 and 60 minutes a week
D Over 60 minutes a week

14. Quiz, panel, or audience participation shows

A Very little or none
B About 30 minutes a week
C Between 30 and 60 minutes a week
D Over 60 minutes a week

15. Cartoons

A Very little or none
B About 30 minutes a week
C Between 30 and 60 minutes a week
D Over 60 minutes a week

16. Movie features

A Very little or none
B Sometimes, but less than one a week
C About one a week
D Two or more a week

17. Sports events

A Very little or none
B Sometimes, but less than one a week
C About one a week
D Two or more a week

18. How much time each week, on the average, have you spent listening to news reports on RADIO or TV?

A Very little or none
B About 30 minutes a week
C Between 30 and 60 minutes a week
D Over 60 minutes a week

How much time each week, on the average, have you spent listening to each of the following kinds of RADIO programs or phonograph RECORDS—during grades 9 and 10?

19. Popular music

A Very little or none
B About 30 minutes a week
C Between 30 and 60 minutes a week
D Over 60 minutes a week

20. Classical or serious music

A Very little or none
B About 30 minutes a week
C Between 30 and 60 minutes a week
D Over 60 minutes a week

21. During school vacations, how much do you watch TV and listen to the radio or records?

A Less than during school terms
B About the same as during school terms
C More than during school terms

During grades 9 and 10, how much time, on the average, have you spent on each of the following? Mark A, B, or C on your answer sheet.

If you answer a starred (*) choice, fill in the blank in this test book.

Do not count things you did as part of your class assignments.

22. Repairing mechanical things, such as appliances, cars

A None or very little
B Some, but less than 2 hours a week*
C 2 hours a week or more*

*Name one ____________________

23. Sewing, embroidering, knitting

A None or very little
B Some, but less than 2 hours a week*
C 2 hours a week or more*

*Name one piece ____________________

24. Experimenting with new recipes

A None or very little
B Some, but less than 2 hours a week
C 2 hours a week or more

25. Working on collections, such as rocks, stamps

A None or very little
B Some, but less than 2 hours a week*
C 2 hours a week or more*

*What do you collect? ____________________

26. Building electronic equipment or performing scientific experiments at home

A None or very little
B Some, but less than 2 hours a week*
C 2 hours a week or more*

*Name one ____________________

27. Model building; for example, airplanes

A None or very little
B Some, but less than 2 hours a week*
C 2 hours a week or more*

*What kind? ____________________

28. Refinishing or building things at home (woodwork, etc.)

A None or very little
B Some, but less than 2 hours a week*
C 2 hours a week or more*

*Name one thing ____________________

29. Taking or developing pictures

A None or very little
B Some, but less than 2 hours a week
C 2 hours a week or more

30. Painting, drawing, or sculpturing

A None or very little
B Some, but less than 2 hours a week*
C 2 hours a week or more*

*Name one subject ____________

31. Practicing, arranging, or composing music

A None or very little
B Some, but less than 2 hours a week*
C 2 hours a week or more*

*What instrument or style? ____________

32. Writing poetry, plays, essays, or stories

A None or very little
B Some, but less than 2 hours a week*
C 2 hours a week or more*

*Give one title ____________

33. Writing letters to friends or relatives

A None or very little
B Some, but less than 2 hours a week
C 2 hours a week or more

34. Taking care of younger brothers or sisters

A None or very little
B Some, but less than 2 hours a week
C 2 hours a week or more

35. Cleaning house

A None or very little
B Some, but less than 2 hours a week
C 2 hours a week or more

36. Cooking for the family

A None or very little
B Some, but less than 2 hours a week
C 2 hours a week or more

37. Riding around on a bicycle

A None or very little
B Some, but less than 2 hours a week
C 2 hours a week or more

38. Riding around on a motorcycle

A None or very little
B Some, but less than 2 hours a week
C 2 hours a week or more

39. Playing individual sports, such as bowling, pool, or swimming

A None or very little
B Some, but less than 2 hours a week
C 2 hours a week or more

40. Practicing sports on your own

A None or very little
B Some, but less than 2 hours a week*
C 2 hours a week or more*

*What? ____________

41. Hunting, fishing, hiking, or camping

A None or very little
B Some, but less than 2 hours a week
C 2 hours a week or more

42. Playing outdoor group sports (not on a regular team)

A None or very little
B Some, but less than 2 hours a week
C 2 hours a week or more

43. Playing indoor table or card games

A None or very little
B Some, but less than 2 hours a week
C 2 hours a week or more

During grades 9 and 10, how often, on the average, have you done each of the following?

If you answer a starred (*) choice, fill in the blank.

44. Attended club meetings

A Less than once a month
B Between once a week and once a month*
C Once a week or more often*

*Name one club ______________________________

45. Attended church social meetings

A Less than once a month
B Between once a week and once a month
C Once a week or more often

46. Attended athletic events

A Less than once a month
B Between once a week and once a month
C Once a week or more often

47. Attended movies

A Less than once a month
B Between once a week and once a month
C Once a week or more often

48. Gone roller or ice skating

A Less than once a month
B Between once a week and once a month
C Once a week or more often

49. Attended dances

A Less than once a month
B Between once a week and once a month
C Once a week or more often

50. Gone on dates

A Less than once a month
B Between once a week and once a month
C Once a week or more often

...much time, on the average, have you spent on each ... following?

51. Riding around in cars

A Less than 1 hour a week
B 1 to 2 hours a week
C More than 2 hours a week

52. Hanging around, just loafing, talking, or snacking with friends

A Less than 1 hour a week
B 1 to 2 hours a week
C More than 2 hours a week

53. Doing personal shopping

A Less than 1 hour a week
B 1 to 2 hours a week
C More than 2 hours a week

54. Going window shopping or just looking in stores

A Less than 1 hour a week
B 1 to 2 hours a week
C More than 2 hours a week

55. Going to the store for the family

A Less than 1 hour a week
B 1 to 2 hours a week
C More than 2 hours a week

56. Taking care of your hair (washing, combing, setting, etc.)

A Less than 1 hour a week
B 1 to 2 hours a week
C More than 2 hours a week

57. Other personal grooming (complexion, nails, etc.)

A Less than 1 hour a week
B 1 to 2 hours a week
C More than 2 hours a week

58. Taking care of your clothes

A Less than 1 hour a week
B 1 to 2 hours a week
C More than 2 hours a week

59. How long, on the average, have you spent talking on the telephone to friends each day?

A Less than 10 minutes a day
B Between 10 and 30 minutes a day
C Over 30 minutes a day

During grades 9 and 10, how many times have you done each of the following?

If you answer a starred (*) choice, fill in the blank in this test book.

Do not count things you did as part of your class assignments.

60. Gone to plays, lectures, concerts, etc., outside of school

A None
B 1 or 2 times*
C More than 2 times*

*Name one ________________

61. Acted in plays, done play production work, or participated in public debates

A None
B 1 or 2 times*
C More than 2 times*

*Name one play or debate topic ________________

62. Made solo musical performances or public speeches

A None
B 1 or 2 times*
C More than 2 times*

*Name one occasion ________________

63. Served as a counselor or leader for young children

A None
B 1 or 2 times*
C More than 2 times*

*Name one occasion ________________

During grades 9 and 10, have you been a member of a musical organization—either in or out of school?

64. Band, orchestra, or other instrumental group

A No
B 1 year*
C 2 years*

65. Chorus, glee club, or other vocal group

A No
B 1 year*
C 2 years*

*What part? ________________

During grades 9 and 10, have you played on athletic teams—either in or out of school?

66. Football

A No
B 1 year*
C 2 years*

*What position? ________________

67. Basketball

A No
B 1 year*
C 2 years*

*What position? ________________

68. Baseball

A No
B 1 year*
C 2 years*

*What position? ________________

69. Track

A No
B 1 year*
C 2 years*

*What event? ________________

70. Other athletic team

A No
B 1 year*
C 2 years*

*Name ________________

71. During grades 9 and 10, have you been a member of a cheering or pep squad?

A No
B 1 year
C 2 years

72. During grades 9 and 10, how many school or class committees have you worked on?

A None
B 1 or 2*
C More than 2*

*What kind? ______

During grades 9 and 10, have you worked on a newspaper, yearbook, or other publication?

73. Newspaper

A No
B 1 year*
C 2 years*

*What job? ______

74. Yearbook

A No
B 1 year*
C 2 years*

*What job? ______

75. Other publication

A No
B 1 year*
C 2 years*

*What? ______

How many BOOKS of the following kinds have you read during the last two years? Do not include class assignments.

76. History, current events, biography, autobiography

A None
B 1 or 2*
C More than 2*

*Name one title ______

77. Books telling how to repair, build, or do things

A None
B 1 or 2*
C More than 2*

*Name one title ______

78. Religious books

A None
B 1 or 2*
C More than 2*

*Name one title ______

79. Sports, romance, mystery, adventure

A None
B 1 or 2*
C More than 2*

*Name one title ______

80. Science

A None
B 1 or 2*
C More than 2*

*Name one title ______

81. Music, art

A None
B 1 or 2*
C More than 2*

*Name one title ______

82. Classical or best seller fiction, poetry, drama

A None
B 1 or 2*
C More than 2*

*Name one title ______

How often, on the average, have you read each of the following kinds of MAGAZINES?

83. Teen-age magazines, such as Seventeen, Boys Life

A Rarely or never
B Occasionally*
C Regularly*

*Name one magazine ______

84. Movie or TV

A Rarely or never
B Occasionally*
C Regularly*

*Name one magazine ______

85. Detective, sports, romance, adventure, mystery, western stories

A Rarely or never
B Occasionally*
C Regularly*

*Name one magazine______________

86. Comic books

A Rarely or never
B Occasionally*
C Regularly*

*Name one______________

87. Hot rod, mechanical, science fiction

A Rarely or never
B Occasionally*
C Regularly*

*Name one______________

88. Outdoor or sports, such as Sports Illustrated

A Rarely or never
B Occasionally*
C Regularly*

*Name one______________

89. Men's or women's magazines, home and garden, fashion

A Rarely or never
B Occasionally*
C Regularly*

*Name one______________

90. News, digest, and general magazines, such as Reader's Digest, Life, Look, Newsweek, Saturday Evening Post

A Rarely or never
B Occasionally*
C Regularly*

*Name one______________

91. Scientific magazines, such as National Geographic

A Rarely or never
B Occasionally*
C Regularly*

*Name one______________

92. Literary magazines, such as Atlantic Monthly

A Rarely or never
B Occasionally*
C Regularly*

*Name one______________

How often have you read each of the following sections of a NEWSPAPER?

93. Comics

A Rarely or never
B Occasionally
C Regularly

94. Sports

A Rarely or never
B Occasionally
C Regularly

95. Society, homemaking

A Rarely or never
B Occasionally
C Regularly

96. News, editorials

A Rarely or never
B Occasionally
C Regularly

97. During grades 9 and 10, how long have you usually worked on school assignments during the evening?

A Seldom or never did homework after school
B Some, but less than 1 hour a day
C 1 hour a day or more

98. During the last two summers, did you go to summer school to make up or do remedial work?

A No
B Yes*

*In what?______________

99. During the last two summers, did you go to summer school to take extra courses?

A No
B Yes*

*In what? ____________

100. During the last two years, have you had private tutoring lessons in any school subjects?

A No
B Yes*

*In what? ____________

101. During the last two years, have you taken regular lessons (individual or group) outside of school—music, dancing, art, sports, etc.?

A No
B Yes*

*In what? ____________

102. During school vacations in the last two years, have you usually had a job?

A No
B Yes, part-time
C Yes, full-time

103. During school vacations in the last two years, how much time, on the average, have you spent reading and studying?

A Very little or none
B Some, but less than 2 hours a week
C 2 hours a week or more

104. Not counting work during vacations, have you worked outside of school during grades 9 and 10? (Don't forget jobs like your own farming, or helping your parents or guardian with their work or business.)

A No (skip to 107)
B Grade 9 only (answer 105)
C Grade 10 only (answer 105)
D Both years (answer 105)

105. During how many months did you work?

A 2 months or less (answer 106)
B Between 2 and 6 months (answer 106)
C 6 months or longer (answer 106)

106. How many hours a week, on the average, did you work?

A 5 hours a week or less*
B Between 5 and 20 hours a week*
C 20 hours a week or more*

*Briefly describe the duties on your most recent job ____________

____

107. Have you worked for the school or teachers during grades 9 and 10—with or without pay? Include such things as helping in the cafeteria, library, or office; grading papers; ushering, parking cars at school events; operating movie projectors or other equipment.

A No (skip to 110)
B Grade 9 only (answer 108)
C Grade 10 only (answer 108)
D Both years (answer 108)

108. During how many months did you work for the school or teachers?

A 2 months or less (answer 109)
B Between 2 and 6 months (answer 109)
C 6 months or longer (answer 109)

109. How many hours a week, on the average, did you work for the school or teachers?

A 5 hours a week or less*
B Between 5 and 20 hours a week*
C 20 hours a week or more*

*Briefly describe what you did ____________

____

110. During the last two years, have you seriously considered any occupation(s) for your life work?

A No
B Yes*

*What? ____________

111. Do you have plans for the year after you graduate from high school?

A Don't plan to graduate (skip to 113)
B Not sure yet (skip to 113)
C Have fairly definite plans (answer 112)

112. Which one of the following best describes them?

A A full-time job or the military service
B A 4-year college
C School or college other than 4-year
D Full-time housewife
E Other*

*What? ______________________________

113. How much formal education does your father or male guardian have?

A Grade school
B Some high school
C Graduated from high school
D Some college, junior college, business or trade school (after completing high school)
E Graduated from college
F Some graduate or professional school (e.g., law, medicine)
G Obtained a graduate or professional degree
H Don't know

114. How much formal education does your mother or female guardian have?

A Grade school
B Some high school
C Graduated from high school
D Some college, junior college, business or trade school (after completing high school)
E Graduated from college
F Some graduate or professional school (e.g., law, medicine)
G Obtained a graduate or professional degree
H Don't know

115A. How does your father or male guardian earn his living? Answer on the lines below. Be as specific as you can—for example, operates milling machine, repairs jewelry, sells candy to retail stores, college English teacher. If he is not now working or if he is dead, say what his occupation was. ______________________________

____

115B. Which of the following occupational groups most nearly describes or is most similar to the occupation of your father or male guardian? If your mother or female guardian is the main support of your family, choose the group that best describes her occupation. Look over all the groups before making your decision.

A Technical—such as draftsman, surveyor, medical or dental technician, nurse, etc.

B Official—such as manufacturer, officer in a large company, banker, government official or inspector, etc.

C Manager—such as sales manager, store manager, office manager, factory supervisor, etc.
Proprietor or owner—such as owner of a small business, wholesaler, retailer, contractor, restaurant owner, etc.

D Semi-skilled worker—such as factory machine operator, bus or cab driver, meat cutter, etc.
Clerical worker—such as bankteller, bookkeeper, sales clerk, office clerk, mail carrier, messenger, secretary, etc.
Service worker—such as a barber, beautician, waiter, etc.
Protective worker—such as policeman, detective, sheriff, fireman, etc.

E Salesman—such as real estate or insurance salesman, factory representative, etc.

F Workman or laborer—such as factory, farm, or mine worker, fisherman, filling station attendant, longshoreman, etc.

G Farm or ranch manager or owner

H Professional—such as accountant, artist, clergyman, dentist, doctor, engineer, lawyer, librarian, scientist, college professor, social worker.

I Skilled worker or foreman—such as baker, carpenter, electrician, enlisted man in the armed forces, mechanic, plumber, plasterer, tailor, foreman in a factory or mine.

116. How many of your friends definitely plan to go to a regular four-year college? (Do not include those going to secretarial or business schools or junior colleges.)

A Almost all (80% or more)
B Most of them (60% to 80%)
C About half (40% to 60%)
D Some of them (20% to 40%)
E Only a few of them (20% or less)

117. How many rooms are there in your home? (Exclude garage, bathrooms, porch, etc. If you live in an apartment, just count the rooms that belong to your immediate family.)

A Three or less
B Four to five
C Six to seven
D Eight to ten
E More than ten

118. How many bathrooms are there in your house or apartment? (Count only those which have a bathtub or shower.)

A None
B One
C Two
D Three
E Four or more

119. How often do your parents encourage you and otherwise show interest in your school work and grades?

A Constantly—deeply interested and encourage me a great deal
B Frequently—interested and give me encouragement
C Sometimes—show occasional interest and encouragement
D Rarely—not particularly interested or encouraging
E Never—not interested or encouraging at all

120. How does your mother feel about your continuing your education beyond high school?

A Strongly favors it
B Moderately favors it
C Neither for nor against it
D Moderately opposed to it
E Strongly opposed to it

121. How does your father feel about your continuing education beyond high school?

A Strongly favors it
B Moderately favors it
C Neither for nor against it
D Moderately opposed to it
E Strongly opposed to it

122. How often do your parents encourage you and otherwise show interest in your hobbies and interests that you engage in on your own time, outside of school?

A Constantly—deeply interested and encourage me a great deal
B Frequently—interested and give me encouragement
C Sometimes—show occasional interest and encouragement
D Rarely—not particularly interested or encouraging
E Never—not interested or encouraging at all

123. Do you have an encyclopedia at home, e.g., World Book, Britannica, etc.?

A Yes
B No, but my parents have considered buying one
C No

124. How often do your parents encourage you and otherwise show interest in your social activities, such as clubs or organizations in which people work together either for some purpose or just to have fun?

A Constantly—deeply interested and encourage me a great deal
B Frequently—interested and give me encouragement
C Sometimes—show occasional interest and encouragement
D Rarely—not particularly interested or encouraging
E Never—not interested or encouraging at all

125. From the list below, which course of study are you taking in high school?

A Academic or college preparatory
B Agricultural
C Business or commercial
D General
E Home economics
F Vocational
G Other*
H Undecided

*What? ______________________

Here is a list of school courses. In each item, Mark A if you did not take the course(s).

If you did take the course, mark B, C, or D to show whether the course was boring or interesting to you.

126. Athletics and physical education

A Didn't take any of these courses
B Boring
C Undecided
D Interesting

127. Typing

A Didn't take this course
B Boring
C Undecided
D Interesting

128. Business and commercial—bookkeeping, business arithmetic, office machines, etc. (do not include typing)

A Didn't take any of these courses
B Boring
C Undecided
D Interesting

129. Driver's education

A Didn't take this course
B Boring
C Undecided
D Interesting

130. English and literature

A Didn't take any of these courses
B Boring
C Undecided
D Interesting

131. Foreign language—Spanish, French, German, Latin, etc.

A Didn't take any of these courses
B Boring
C Undecided
D Interesting

132. Social studies—history, geography, government, etc.

A Didn't take any of these courses
B Boring
C Undecided
D Interesting

133. Home economics, agriculture, shop, or vocational

A Didn't take any of these courses
B Boring
C Undecided
D Interesting

134. Mathematics—algebra, geometry, trigonometry, etc.

A Didn't take any of these courses
B Boring
C Undecided
D Interesting

135. Science—biology, chemistry, physics, etc.

A Didn't take any of these courses
B Boring
C Undecided
D Interesting

Do you think the following courses will be useful in helping you earn a living?

136. Athletics and physical education

A Didn't take any of these courses
B Not useful
C Undecided
D Useful

137. Typing

A Didn't take this course
B Not useful
C Undecided
D Useful

138. Business and commercial—bookkeeping, business arithmetic, office machines, etc. (do not include typing)

A Didn't take any of these courses
B Not useful
C Undecided
D Useful

139. Driver's education

A Didn't take this course
B Not useful
C Undecided
D Useful

140. English and literature

A Didn't take any of these courses
B Not useful
C Undecided
D Useful

141. Foreign language—Spanish, French, German, Latin, etc.

A Didn't take any of these courses
B Not useful
C Undecided
D Useful

142. Social studies—history, geography, government, etc.

A Didn't take any of these courses
B Not useful
C Undecided
D Useful

143. Home economics, agriculture, shop, or vocational

A Didn't take any of these courses
B Not useful
C Undecided
D Useful

144. Mathematics—algebra, geometry, trigonometry, etc.

A Didn't take any of these courses
B Not useful
C Undecided
D Useful

145. Science—biology, chemistry, physics, etc.

A Didn't take any of these courses
B Not useful
C Undecided
D Useful

Here are some things teen-agers sometimes think and talk about. During the last two years, how often have you thought about each of them?

146. Your educational and vocational plans after high school

A Rarely or never
B Occasionally
C Frequently

147. TV, sports, movies, popular music

A Rarely or never
B Occasionally
C Frequently

148. Personal values—decent behavior, religion, honesty, etc.

A Rarely or never
B Occasionally
C Frequently

149. World unrest; the cold war; threats to the American way of life

A Rarely or never
B Occasionally
C Frequently

How often have you talked about each of the following with your friends?

150. Your educational and vocational plans after high school

A Rarely or never
B Occasionally
C Frequently

151. TV, sports, movies, popular music

A Rarely or never
B Occasionally
C Frequently

152. Personal values—decent behavior, religion, honesty, etc.

A Rarely or never
B Occasionally
C Frequently

153. World unrest; the cold war; threats to the American way of life

A Rarely or never
B Occasionally
C Frequently

154. The news events of the day

A Rarely or never
B Occasionally
C Frequently

155. Science

A Rarely or never
B Occasionally
C Frequently

156. Literature, music, art

A Rarely or never
B Occasionally
C Frequently

How often have you talked about each of the following with your parents?

157. Your educational and vocational plans after high school

A Rarely or never
B Occasionally
C Frequently

158. TV, sports, movies, popular music

A Rarely or never
B Occasionally
C Frequently

159. Personal values—decent behavior, religion, honesty, etc.

A Rarely or never
B Occasionally
C Frequently

160. World unrest; the cold war; threats to the American way of life

A Rarely or never
B Occasionally
C Frequently

161. The news events of the day

A Rarely or never
B Occasionally
C Frequently

162. Science

A Rarely or never
B Occasionally
C Frequently

163. Literature, music, art

A Rarely or never
B Occasionally
C Frequently

How often have you talked with your teachers outside of class about—

164. your educational and vocational plans after high school?

A Rarely or never
B Occasionally
C Frequently

165. TV, sports, movies, popular music?

A Rarely or never
B Occasionally
C Frequently

166. personal values—decent behavior, religion, honesty, etc.?

A Rarely or never
B Occasionally
C Frequently

How many times have your talked with your school counselor about—

167. your educational and vocational plans after high school?

A None
B Once or twice
C Three or more times

168. TV, sports, movies, popular music?

A None
B Once or twice
C Three or more times

169. personal values—decent behavior, religion, honesty, etc.?

A None
B Once or twice
C Three or more times

170. Do your parents reward you for getting good grades by granting extra privileges, making gifts of money, increasing your allowance, or in some other way?

A Always
B Frequently
C Sometimes
D Seldom
E Never

171. Do your parents punish you for getting poor grades by taking away privileges, cutting your allowance, giving extra chores, or in some other way?

A Always
B Frequently
C Sometimes
D Seldom
E Never

How many semesters of each of the following did you take in grades 9 and 10? 1 year = 2 semesters. For example, if you took French for a full year and Spanish for half a year, this should be counted as 3 semesters of foreign language.

172. Foreign languages—French, Spanish, German, Latin, etc.

A 0
B 1 or 2 semesters
C 3 or 4 semesters
D 5 or 6 semesters
E 7 or more semesters

173. Business and commercial—bookkeeping, business arithmetic, office machines, typing, etc.

A 0
B 1 or 2 semesters
C 3 or 4 semesters
D 5 or 6 semesters
E 7 or more semesters

174. Social studies—history, geography, government, etc.

A 0
B 1 or 2 semesters
C 3 or 4 semesters
D 5 or 6 semesters
E 7 or more semesters

175. Home economics, agriculture, shop, or vocational

A 0
B 1 or 2 semesters
C 3 or 4 semesters
D 5 or 6 semesters
E 7 or more semesters

176. Mathematics—algebra, geometry, trigonometry, etc.

A 0
B 1 or 2 semesters
C 3 or 4 semesters
D 5 or 6 semesters
E 7 or more semesters

177. Science—biology, chemistry, physics, etc.

A 0
B 1 or 2 semesters
C 3 or 4 semesters
D 5 or 6 semesters
E 7 or more semesters

END OF BEQ

Table E-1

Selected BEQ Responses by Curriculum

	Acad.	Agri.	Bus.	Gen.	Home Ec.	Voc.	Other	Undec.	Non-Acad.
110. Considered occupation for life work									
1. No	22	29	22	39	32	25	31	50	29
2. Yes	77	68	77	59	65	74	66	46	69
3. No Response	1	3	1	2	3	1	3	4	0
111. Plans following graduation									
1. Don't plan to graduate	0	4	1	3	6	2	4	3	2
2. Unsure	14	36	31	37	36	30	33	48	33
3. Have plans	85	60	67	59	57	66	58	47	63
4. No Response	1	0	1	1	1	2	5	2	0
112. Plans following graduation by curriculum (Q112)									
1. Full time job or service	5	32	17	24	21	28	14	21	22
2. 4 year college	62	20	13	16	19	18	26	15	16
3. School or college other than 4 year college	16	12	23	14	8	16	18	13	18
4. Housewife	1	4	5	5	10	2	3	2	4
5. Other	5	13	19	12	16	13	15	13	15
6. No response	11	19	23	29	26	23	24	36	0

Table E-1 (cont.)

Selected BEQ Responses by Curriculum

	Acad.	Agri.	Bus.	Gen.	Home Ec.	Voc.	Other	Undec.	Non-Acad.
113. Father's education									
1. Grade school	5	10	11	11	18	15	8	11	12
2. Some high school	14	32	31	28	25	28	28	23	29
3. High school graduation	24	39	31	28	10	33	32	27	30
4. Some college or trade school	20	4	11	10	13	10	7	7	10
5. College graduation	16	5	5	6	5	4	7	7	5
6. Some graduate school	4	0	1	1	1	0	1	2	1
7. Graduate degree	12	5	1	2	1	2	4	3	2
8. Don't know	5	6	9	12	14	7	11	18	10
9. No response	0	0	0	2	3	1	2	2	0
115B. Father's occupation									
1. Technical	5	11	4	6	5	4	8	8	5
2. Official	6	11	4	5	5	4	6	5	5
3. Manager or owner	22	17	14	14	16	11	14	12	14
4. Semi-skilled, clerical, service or protective worker	18	8	30	28	17	30	19	18	28
5. Salesman	6	1	3	4	4	2	4	3	3
6. Workman	7	19	17	13	17	16	13	13	15
7. Farm manager or owner	2	12	1	2	3	2	3	3	2
8. Professional	18	8	3	4	4	4	4	5	4
9. Skilled worker or foreman	14	6	19	13	20	21	18	21	17
10. No response	2	7	5	11	9	6	11	12	0

Table E-1 (cont.)

Selected BEQ Responses by Curriculum

		Acad.	Agri.	Bus.	Gen.	Home Ec.	Voc.	Other	Undec.	Non-Acad.
116.	Percent of friends planning to attend 4 year college									
	1. 80% or more	43	17	9	13	14	9	18	13	11
	2. 60%-80%	27	15	17	17	19	14	19	15	16
	3. 40%-60%	17	37	25	23	19	19	20	20	23
	4. 20%-40%	8	14	21	21	13	26	15	16	21
	5. 20% or less	4	15	27	25	34	31	26	34	27
	6. No response	1	2	1	1	1	1	2	2	0
120.	Mother's feelings about continuing education									
	1. Strongly favors	88	52	52	56	49	54	59	61	54
	2. Moderately favors	8	23	21	20	14	22	17	18	21
	3. Neither for nor against	3	19	25	20	23	22	17	18	22
	4. Moderately opposed	0	4	2	1	5	1	2	1	2
	5. Strongly opposed	0	2	1	1	5	1	4	2	1
	6. No response	1	0	0	2	4	0	1	0	0
121.	Father's feelings about continuing education									
	1. Strongly favors	85	48	52	52	40	53	53	56	52
	2. Moderately favors	8	24	19	20	16	20	22	17	20
	3. Neither for nor against	5	21	25	21	36	22	17	22	23
	4. Moderately opposed	0	2	1	1	1	1	4	1	1
	5. Strongly opposed	0	4	1	1	4	1	4	3	1
	6. No response	2	1	2	5	3	3	0	1	0

Table E-1 (cont.)

Selected BEQ Responses by Curriculum

	Acad.	Agri.	Bus.	Gen.	Home Ec.	Voc.	Other	Undec.	Non-Acad.
126. Athletics-physical education									
1. Didn't take	3	12	6	8	18	7	11	7	8
2. Boring	9	12	10	9	6	8	9	12	9
3. Undecided	18	20	22	17	12	17	17	16	12
4. Interesting	70	56	61	66	64	68	63	65	64
5. No response	0	0	1	0	0	0	0	0	0
127. Typing									
1. Didn't take	48	43	12	44	34	77	49	35	39
2. Boring	10	23	6	11	19	4	8	15	8
3. Undecided	12	11	14	14	8	5	11	13	12
4. Interesting	30	24	67	31	39	14	32	36	41
5. No response	0	0	1	0	0	0	0	1	0
128. Business-commercial									
1. Didn't take	84	43	17	53	48	69	59	49	43
2. Boring	3	17	6	7	18	6	9	12	7
3. Undecided	4	19	17	16	9	9	6	19	15
4. Interesting	9	21	60	24	25	15	25	20	35
5. No response	0	0	0	0	0	1	1	0	0

Table E-1 (cont.)

Selected BEQ Responses by Curriculum

		Acad.	Agri.	Bus.	Gen.	Home Ec.	Voc.	Other	Undec.	Non-Acad.
129.	Driver's education									
	1. Didn't take	34	29	41	41	42	46	39	26	42
	2. Boring	10	11	7	8	4	3	10	15	7
	3. Undecided	11	10	10	10	13	7	11	11	10
	4. Interesting	43	51	41	40	42	42	38	47	41
	5. No response	2	0	1	1	0	2	2	1	0
130.	English and literature									
	1. Didn't take	1	8	2	4	6	3	2	4	3
	2. Boring	14	26	20	27	27	33	28	30	26
	3. Undecided	25	35	30	29	18	29	30	28	29
	4. Interesting	60	31	48	39	45	32	38	38	41
	5. No response	0	0	0	1	4	3	2	0	0
131.	Foreign language									
	1. Didn't take	8	64	42	50	51	65	44	42	50
	2. Boring	23	12	19	20	13	13	32	29	18
	3. Undecided	19	10	13	10	16	6	5	13	10
	4. Interesting	50	14	25	18	19	14	16	15	20
	5. No response	0	0	1	2	1	2	3	1	0

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Table E-1 (cont.)

Selected BEQ Responses by Curriculum

	Acad.	Agri.	Bus.	Gen.	Home Ec.	Voc.	Other	Undec.	Non-Acad.
132. Social studies									
1. Didn't take	2	5	2	3	10	3	4	3	3
2. Boring	17	30	33	26	32	22	30	28	28
3. Undecided	19	23	25	26	19	23	23	26	25
4. Interesting	63	43	39	44	36	49	42	43	43
5. No response	0	0	1	1	3	3	1	0	0
133. Home economics, shop, agriculture, vocational									
1. Didn't take	49	12	26	23	8	5	32	29	20
2. Boring	8	15	9	8	6	4	4	8	8
3. Undecided	10	14	13	14	6	9	11	15	12
4. Interesting	32	58	50	54	78	79	49	45	58
5. No response	1	1	2	1	2	3	4	3	0
134. Mathematics									
1. Didn't take	1	15	19	16	21	8	16	16	16
2. Boring	17	27	23	27	23	25	25	33	25
3. Undecided	24	30	24	24	23	29	22	20	25
4. Interesting	57	27	33	31	30	35	32	30	32
5. No response	1	1	1	2	3	3	5	1	0

Table E-1 (cont.)

Selected BEQ Responses by Curriculum

	Acad.	Agri.	Bus.	Gen.	Home Ec.	Voc.	Other	Undec.	Non-Acad.
135. Science									
1. Didn't take	4	13	11	11	17	10	13	10	11
2. Boring	11	17	22	19	22	19	19	21	20
3. Undecided	16	25	19	19	17	20	19	20	19
4. Interesting	69	45	47	50	43	48	44	48	48
5. No response	0	0	1	1	1	3	5	1	0
136. Athletics-Physical education Useful in helping to earn a living?									
1. Didn't take	3	6	5	6	10	5	11	7	6
2. Not useful	40	24	41	27	27	27	31	28	32
3. Undecided	23	14	21	24	16	22	19	22	22
4. Useful	33	54	31	43	45	44	36	41	39
5. No response	1	2	2	0	2	2	3	2	0
137. Typing--Useful in helping to earn a living?									
1. Didn't take	39	38	8	34	26	60	39	26	30
2. Not useful	6	12	3	9	6	7	8	10	6
3. Undecided	11	15	6	11	8	8	9	18	9
4. Useful	44	35	82	45	57	22	41	44	54
5. No response	0	0	1	1	3	3	3	2	0

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Table E-1 (cont.)

Selected BEQ Responses by Curriculum

	Acad.	Agri.	Bus.	Gen.	Home Ec.	Voc.	Other	Undec.	Non-Acad.
138. Business and commercial Useful in helping to earn a living?									
1. Didn't take	70	37	10	39	38	54	43	42	31
2. Not useful	6	12	2	6	9	6	9	9	9
3. Undecided	7	14	7	13	8	8	11	17	10
4. Useful	17	36	78	40	43	28	34	31	51
5. No response	0	1	3	2	2	4	3	1	0
139. Driver's education Useful in helping to earn a living?									
1. Didn't take	28	23	27	31	29	37	28	21	30
2. Not useful	17	8	9	9	9	8	11	11	9
3. Undecided	12	12	11	11	12	8	9	13	10
4. Useful	42	57	51	48	48	43	48	53	48
5. No response	1	0	2	1	2	4	4	2	0
140. English and literature Useful in helping to earn a living?									
1. Didn't take	0	10	1	3	4	2	3	4	2
2. Not useful	7	23	8	11	13	15	13	14	11
3. Undecided	15	18	16	22	19	17	19	21	18
4. Useful	77	49	74	63	61	61	61	60	66
5. No response	1	0	1	1	3	5	4	1	0

Table E-1 (cont.)

Selected BEQ Responses by Curriculum

	Acad.	Agri.	Bus.	Gen.	Home Ec.	Voc.	Other	Undec.	Non-Acad.
141. Foreign language--Useful in helping to earn a living?									
1. Didn't take	6	48	30	38	34	49	32	28	37
2. Not useful	26	26	27	24	19	22	24	26	25
3. Undecided	25	12	20	19	16	12	16	20	18
4. Useful	42	14	21	18	27	12	25	23	18
5. No response	1	0	2	1	4	5	3	3	0
142. Social studies--Useful in helping to earn a living?									
1. Didn't take	1	11	2	3	3	4	4	4	3
2. Not useful	21	27	27	23	29	24	21	29	25
3. Undecided	29	21	33	33	27	28	31	28	31
4. Useful	49	40	35	40	36	40	39	38	38
5. No response	0	1	3	1	5	4	5	1	0
143. Home economics, shop, agriculture, vocational Useful in helping to earn a living?									
1. Didn't take	41	12	19	17	4	5	23	21	15
2. Not useful	17	12	17	9	8	4	8	10	11
3. Undecided	13	10	18	17	5	7	15	22	15
4. Useful	28	67	43	55	78	79	50	44	56
5. No response	1	0	3	2	5	5	4	3	0

Table E-1 (cont.)

Selected BEQ Responses by Curriculum

	Acad.	Agri.	Bus.	Gen.	Home Ec.	Voc.	Other	Undec.	Non-Acad.
144. Mathematics--Useful in helping to earn a living?									
1. Didn't take	1	14	13	12	8	8	11	11	12
2. Not useful	10	18	13	12	18	8	7	12	12
3. Undecided	16	20	21	19	16	15	13	21	19
4. Useful	71	46	51	55	52	64	64	53	55
5. No response	2	2	2	2	6	5	5	3	0
145. Science--Useful in helping to earn a living?									
1. Didn't take	3	5	8	8	4	7	12	9	8
2. Not useful	14	17	33	23	27	23	18	22	26
3. Undecided	23	30	28	28	17	23	25	32	27
4. Useful	59	49	28	40	44	41	39	34	36
5. No response	1	0	3	1	8	6	6	3	0
146. Educational and vocational plans--How often thought about in last two years?									
1. Rarely or never	2	8	5	10	13	6	12	13	7
2. Occasionally	29	55	42	46	42	40	46	53	44
3. Frequently	67	36	51	42	39	48	38	32	46
4. No response	2	1	2	2	6	6	4	2	0

Table E-1 (cont.)

Selected BEQ Responses by Curriculum

	Acad.	Agri.	Bus.	Gen.	Home Ec.	Voc.	Other	Undec.	Non-Acad.
50. Educational and vocational plans--How often talked about with friends?									
1. Rarely or never	10	23	13	20	19	14	23	22	16
2. Occasionally	52	55	51	51	44	49	51	52	51
3. Frequently	36	21	32	26	30	29	21	22	29
4. No response	2	1	4	3	7	8	5	4	0
57. Educational and vocational plans--How often talked about with parents?									
1. Rarely or never	7	27	15	22	22	16	18	25	18
2. Occasionally	42	49	44	50	42	46	46	48	47
3. Frequently	48	24	37	26	27	28	28	23	30
4. No response	3	0	4	2	9	10	8	4	0
64. Educational and vocational plans--How often talked about with teachers?									
1. Rarely or never	59	50	64	67	60	55	54	73	62
2. Occasionally	32	37	25	24	25	26	32	19	26
3. Frequently	7	12	6	6	6	7	5	3	6
4. No response	2	1	5	3	9	12	9	5	0

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Table E-1 (cont.)

Selected BEQ Responses by Curriculum

	Acad.	Agri.	Bus.	Gen.	Home Ec.	Voc.	Other	Undec.	Non-Acad.
167. Educational and vocational plans--How often talked about with counselor?									
1. Rarely or never	34	51	43	49	43	42	37	50	45
2. Occasionally	49	35	42	40	38	35	39	36	40
3. Frequently	15	13	10	8	10	9	15	8	9
4. No response	2	1	5	3	9	14	9	6	0
172. Foreign languages Semesters taken in grades 9 & 10									
1. 0	10	67	43	53	43	61	49	44	51
2. 1 or 2 semesters	18	14	24	23	26	16	25	29	22
3. 3 or 4 semesters	59	12	22	16	14	4	10	16	15
4. 5 or 6 semesters	6	5	3	2	1	2	1	3	2
5. 7 or more semesters	3	1	1	1	1	0	3	1	1
6. No response	3	1	7	5	15	17	12	7	0
173. Business and commercial Semesters taken in grades 9 & 10									
1. 0	65	40	22	41	35	51	48	37	36
2. 1 or 2 semesters	24	38	43	37	29	22	25	44	36
3. 3 or 4 semesters	5	11	21	12	16	9	9	11	15
4. 5 or 6 semesters	1	4	5	3	4	1	3	2	3
5. 7 or more semesters	1	6	3	2	3	1	4	1	2
6. No response	4	1	6	5	13	16	11	5	0

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Table E-1 (cont.)

Selected BEQ Responses by Curriculum

	Acad.	Agri.	Bus.	Gen.	Home Ec.	Voc.	Other	Undec.	Non-Acad.
174. Social studies Semesters taken in grades 9 & 10									
1. 0	3	10	3	5	10	5	5	4	5
2. 1 or 2 semesters	31	25	28	33	31	35	25	37	31
3. 3 or 4 semesters	53	40	43	42	39	33	38	39	40
4. 5 or 6 semesters	5	12	10	10	1	6	9	7	9
5. 7 or more semesters	5	12	8	6	4	5	11	7	7
6. No response	3	1	8	4	15	16	12	6	0
175. Home economics, agriculture, shop, vocational Semesters taken in grades 9 & 10									
1. 0	56	8	27	24	9	6	34	33	21
2. 1 or 2 semesters	27	24	39	35	21	26	26	31	34
3. 3 or 4 semesters	11	38	20	27	40	37	19	21	27
4. 5 or 6 semesters	2	20	4	7	9	7	4	5	6
5. 7 or more semesters	1	8	2	3	6	7	4	4	4
6. No response	3	2	8	4	15	17	13	6	0

Table E-1 (cont.)

Selected BEQ Responses by Curriculum

	Acad.	Agri.	Bus.	Gen.	Home Ec.	Voc.	Other	Undec.	Non-Acad.
176. Mathematics Semesters taken in grades 9 & 10									
1. 0	1	18	13	13	12	7	11	13	12
2. 1 or 2 semesters	9	24	36	37	39	23	22	35	33
3. 3 or 4 semesters	75	40	34	35	27	42	41	32	36
4. 5 or 6 semesters	7	6	6	8	5	7	6	9	7
5. 7 or more semesters	4	10	4	2	3	5	8	4	4
6. No response	4	2	7	5	14	16	12	7	0
177. Science Semesters taken in grades 9 & 10									
1. 0	3	13	7	6	9	8	7	15	7
2. 1 or 2 semesters	44	46	50	56	42	41	41	49	50
3. 3 or 4 semesters	43	21	28	25	32	28	29	22	27
4. 5 or 6 semesters	3	7	5	5	0	5	6	6	5
5. 7 or more semesters	3	10	4	2	3	2	4	2	3
6. No response	4	3	6	6	14	16	13	6	0

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Table E-2

Means and Standard Deviations of SCAT Q Scores
by Curriculum and Year

CURRICULUM		1961	1963	1965	1967
ACADEMIC	N	2105.00	2069.00	1881.00	2075.00
	MEAN	259.93	280.28	296.24	302.07
	SD	8.76	14.11	15.34	16.23
AGRICUL	N	23.00	23.00	23.00	22.00
	MEAN	253.35	269.57	286.26	287.91
	SD	7.81	11.29	14.09	15.44
BUSINESS	N	674.00	660.00	664.00	649.00
	MEAN	254.03	269.00	280.99	284.43
	SD	6.78	9.24	13.40	14.66
GENERAL	N	613.00	608.00	595.00	585.00
	MEAN	252.68	268.22	279.34	282.11
	SD	8.16	10.42	14.50	15.69
HOME EC	N	23.00	22.00	21.00	21.00
	MEAN	249.87	265.23	276.76	280.57
	SD	8.07	9.83	8.82	11.40
VOCAT"L	N	318.00	305.00	309.00	313.00
	MEAN	253.04	268.71	281.88	286.76
	SD	6.97	9.92	13.44	14.90

Table E-3

Means and Standard Deviations of SCAT V Scores
by Curriculum and Year

CURRICULUM		1961	1963	1965	1967
ACADEMIC	N	2105.00	2068.00	1883.00	2080.00
	MEAN	254.03	268.74	281.72	289.64
	SD	12.00	12.30	12.01	13.06
AGRICUL	N	23.00	23.00	23.00	23.00
	MEAN	240.96	254.30	264.83	271.09
	SD	6.87	10.19	10.34	10.13
BUSINESS	N	674.00	660.00	664.00	657.00
	MEAN	244.43	256.66	267.40	274.11
	SD	8.66	10.00	11.96	12.03
GENERAL	N	613.00	608.00	595.00	588.00
	MEAN	243.77	256.81	267.83	273.87
	SD	9.60	10.90	13.06	13.03
HOME EC	N	23.00	22.00	21.00	23.00
	MEAN	239.52	252.95	262.95	266.22
	SD	11.67	11.19	11.43	13.64
VOCAT"L	N	318.00	306.00	310.00	317.00
	MEAN	243.28	256.04	268.38	274.08
	SD	8.95	10.46	12.66	11.98

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Table E-4

Means and Standard Deviations of SCAT T Scores by Curriculum and Year

CURRICULUM		1961	1963	1965	1967
ACADEMIC	N	2105.00	2068.00	1881.00	2074.00
	MEAN	259.33	274.77	288.48	295.16
	SD	7.95	10.26	10.96	12.30
AGRICUL	N	23.00	23.00	23.00	22.00
	MEAN	251.52	263.78	275.57	279.18
	SD	5.44	8.40	9.05	9.70
BUSINESS	N	674.00	660.00	664.00	648.00
	MEAN	252.95	264.01	275.04	279.73
	SD	5.44	7.43	10.04	10.82
GENERAL	N	613.00	608.00	595.00	583.00
	MEAN	252.25	264.40	274.77	278.64
	SD	6.26	8.38	10.90	11.89
HOME EC	N	23.00	22.00	21.00	21.00
	MEAN	249.78	261.41	271.14	274.90
	SD	7.50	8.90	8.45	10.96
VOCAT"L	N	318.00	305.00	309.00	313.00
	MEAN	252.07	264.22	275.97	280.57
	SD	5.37	7.49	9.97	10.36

Table E-5

Means and Standard Deviations of Math Scores
by Curriculum and Year

URRICULUM		1961	1963	1965	1967
ACADEMIC	N	2111.00	2076.00	1893.00	2074.00
	MEAN	250.91	264.88	275.63	282.45
	SD	10.54	12.43	12.16	13.78
AGRICUL	N	23.00	22.00	23.00	23.00
	MEAN	243.22	257.68	266.30	275.00
	SD	9.96	11.02	10.67	11.58
BUSINESS	N	679.00	664.00	664.00	653.00
	MEAN	242.36	251.66	261.39	266.70
	SD	9.11	12.22	12.35	15.50
GENERAL	N	618.00	603.00	599.00	592.00
	MEAN	242.02	251.97	261.58	267.26
	SD	9.80	13.13	13.35	16.66
HOME EC	N	23.00	23.00	22.00	22.00
	MEAN	238.48	245.83	254.23	265.86
	SD	8.55	12.79	12.66	15.02
VOCAT"L	N	319.00	312.00	310.00	313.00
	MEAN	242.15	252.79	263.51	268.86
	SD	9.22	12.22	11.82	15.44

Table E-6

Means and Standard Deviations of Science Scores
by Curriculum and Year

CURRICULUM		1961	1963	1965	1967
ACADEMIC	N	2101.00	2074.00	1894.00	2066.00
	MEAN	259.40	270.58	279.63	285.95
	SD	12.34	11.37	12.85	12.19
AGRICUL	N	23.00	23.00	23.00	23.00
	MEAN	251.17	263.48	271.57	276.78
	SD	11.95	9.53	12.32	13.31
BUSINESS	N	678.00	659.00	660.00	645.00
	MEAN	248.26	260.17	265.56	273.60
	SD	9.77	8.73	10.29	9.86
GENERAL	N	615.00	606.00	600.00	577.00
	MEAN	248.79	260.70	265.93	275.12
	SD	12.01	9.62	12.11	11.77
HOME EC	N	23.00	23.00	21.00	21.00
	MEAN	242.48	258.00	259.10	273.33
	SD	12.67	8.17	9.59	10.27
VOCAT"L	N	317.00	311.00	313.00	313.00
	MEAN	249.18	260.10	267.03	274.99
	SD	10.98	9.51	12.62	11.86

Table E-7

Means and Standard Deviations of Social Studies
Scores by Curriculum and Year

CURRICULUM		1961	1963	1965	1967
ACADEMIC	N	2105.00	2074.00	1893.00	2075.00
	MEAN	255.71	267.00	278.68	285.03
	SD	11.33	13.49	13.95	13.98
AGRICUL	N	23.00	23.00	22.00	23.00
	MEAN	243.91	255.17	265.82	268.09
	SD	8.82	9.32	14.41	10.93
BUSINESS	N	678.00	660.00	670.00	650.00
	MEAN	246.00	254.88	263.84	269.43
	SD	9.06	9.42	11.76	11.48
GENERAL	N	616.00	605.00	599.00	587.00
	MEAN	245.89	254.53	263.48	268.78
	SD	10.47	10.26	13.55	11.91
HOME EC	N	23.00	23.00	22.00	21.00
	MEAN	241.00	251.43	257.64	268.62
	SD	9.86	10.05	10.53	10.96
VOCAT"L	N	320.00	310.00	313.00	314.00
	MEAN	245.64	254.27	264.67	268.59
	SD	9.75	9.67	13.12	11.79

Table E-8

Means and Standard Deviations of Writing Scores
by Curriculum and Year

URRICULUM		1961	1963	1965	1967
ACADEMIC	N	2102.00	2075.00	1888.00	2074.00
	MEAN	261.81	271.90	285.22	296.04
	SD	13.50	15.58	16.26	16.61
AGRICUL	N	23.00	23.00	23.00	23.00
	MEAN	248.22	256.91	266.00	273.04
	SD	10.33	15.97	15.42	10.23
BUSINESS	N	679.00	661.00	666.00	652.00
	MEAN	253.19	259.59	272.00	281.98
	SD	12.67	14.08	15.74	15.32
GENERAL	N	617.00	607.00	601.00	596.00
	MEAN	249.98	255.91	266.73	276.90
	SD	13.51	14.33	16.62	15.84
HOME EC	N	23.00	23.00	22.00	21.00
	MEAN	249.17	255.43	263.45	280.29
	SD	12.91	14.57	13.51	13.45
VOCAT"L	N	318.00	310.00	314.00	315.00
	MEAN	248.30	255.72	267.69	275.51
	SD	12.67	13.84	17.03	15.69

Table E-9

Means and Standard Deviations of Listening Scores by Curriculum and Year

CURRICULUM		1961	1963	1965	1967
ACADEMIC	N	2103.00	2079.00	1868.00	2067.00
	MEAN	272.97	283.94	291.66	296.98
	SD	11.71	13.40	14.01	14.11
AGRICUL	N	23.00	22.00	23.00	23.00
	MEAN	261.87	270.50	275.91	282.30
	SD	12.18	8.69	10.98	11.76
BUSINESS	N	678.00	668.00	653.00	647.00
	MEAN	261.50	270.16	277.59	283.61
	SD	11.03	11.34	12.10	12.64
GENERAL	N	616.00	609.00	573.00	592.00
	MEAN	262.90	270.89	278.36	283.33
	SD	11.80	12.48	13.27	13.62
HOME EC	N	23.00	23.00	19.00	21.00
	MEAN	255.70	266.26	271.16	282.57
	SD	13.45	11.08	10.50	13.04
VOCAT"L	N	319.00	311.00	303.00	315.00
	MEAN	263.01	270.84	277.73	283.86
	SD	11.10	12.22	12.81	14.18

Table E-10

Means and Standard Deviations of Reading Scores by Curriculum and Year

CURRICULUM		1961	1963	1965	1967
ACADEMIC	N	2109.00	2071.00	1892.00	2075.00
	MEAN	264.09	278.01	288.93	300.74
	SD	15.88	16.00	13.54	15.15
AGRICUL	N	23.00	23.00	22.00	22.00
	MEAN	246.87	259.30	269.00	279.95
	SD	12.78	14.62	14.88	14.40
BUSINESS	N	678.00	659.00	664.00	648.00
	MEAN	252.78	263.93	276.60	286.56
	SD	13.23	15.35	15.36	15.67
GENERAL	N	616.00	608.00	600.00	580.00
	MEAN	250.70	261.49	272.31	282.80
	SD	14.16	16.27	16.63	16.95
HOME EC	N	23.00	23.00	22.00	21.00
	MEAN	246.30	256.04	265.68	281.95
	SD	13.24	13.12	18.01	16.52
VOCAT"L	N	319.00	311.00	313.00	316.00
	MEAN	249.53	260.29	270.98	280.89
	SD	13.01	15.88	16.55	17.96

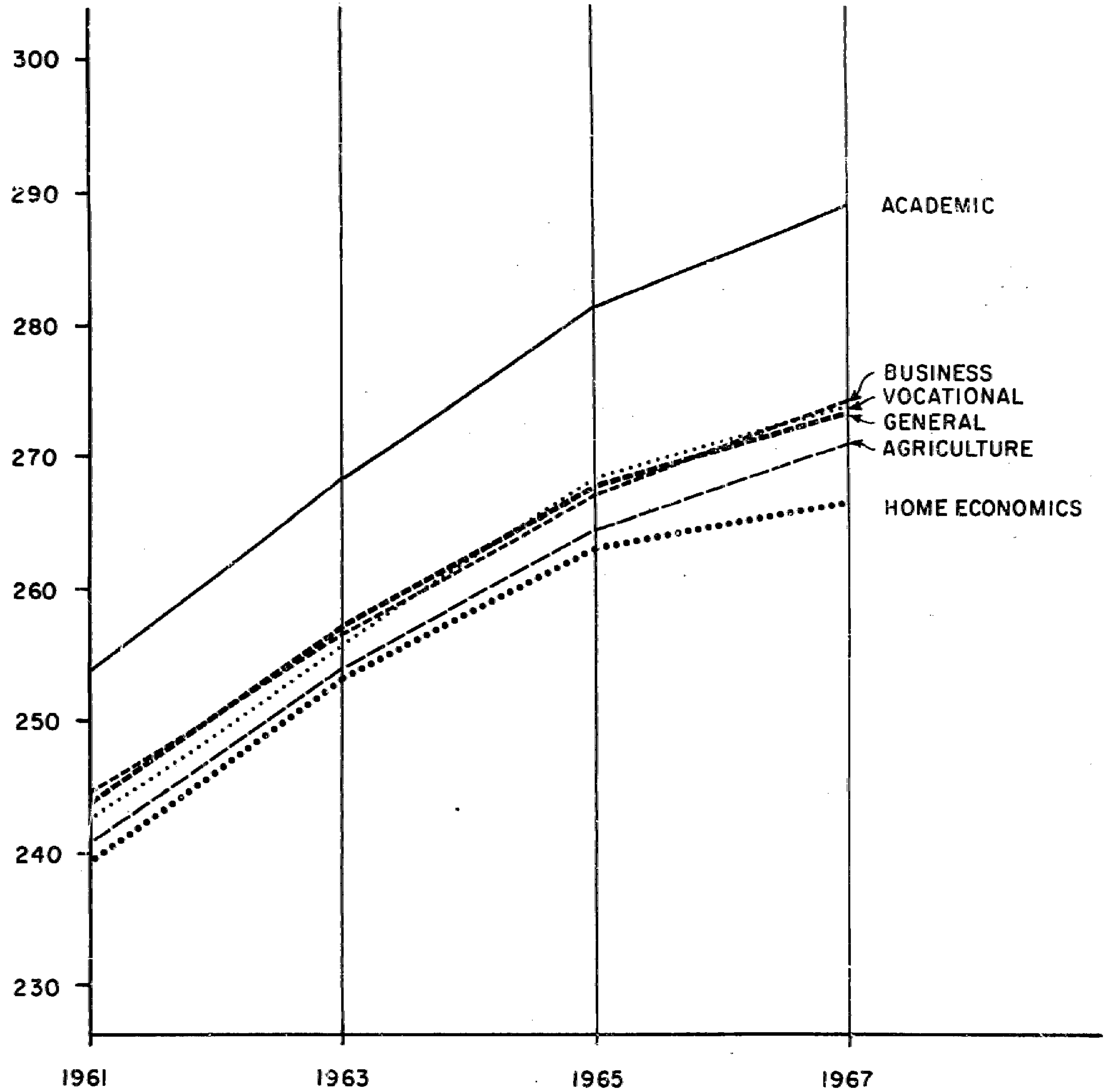

Figure E-1. Mean Scores on SCAT Verbal for Six Major Curriculum Groups

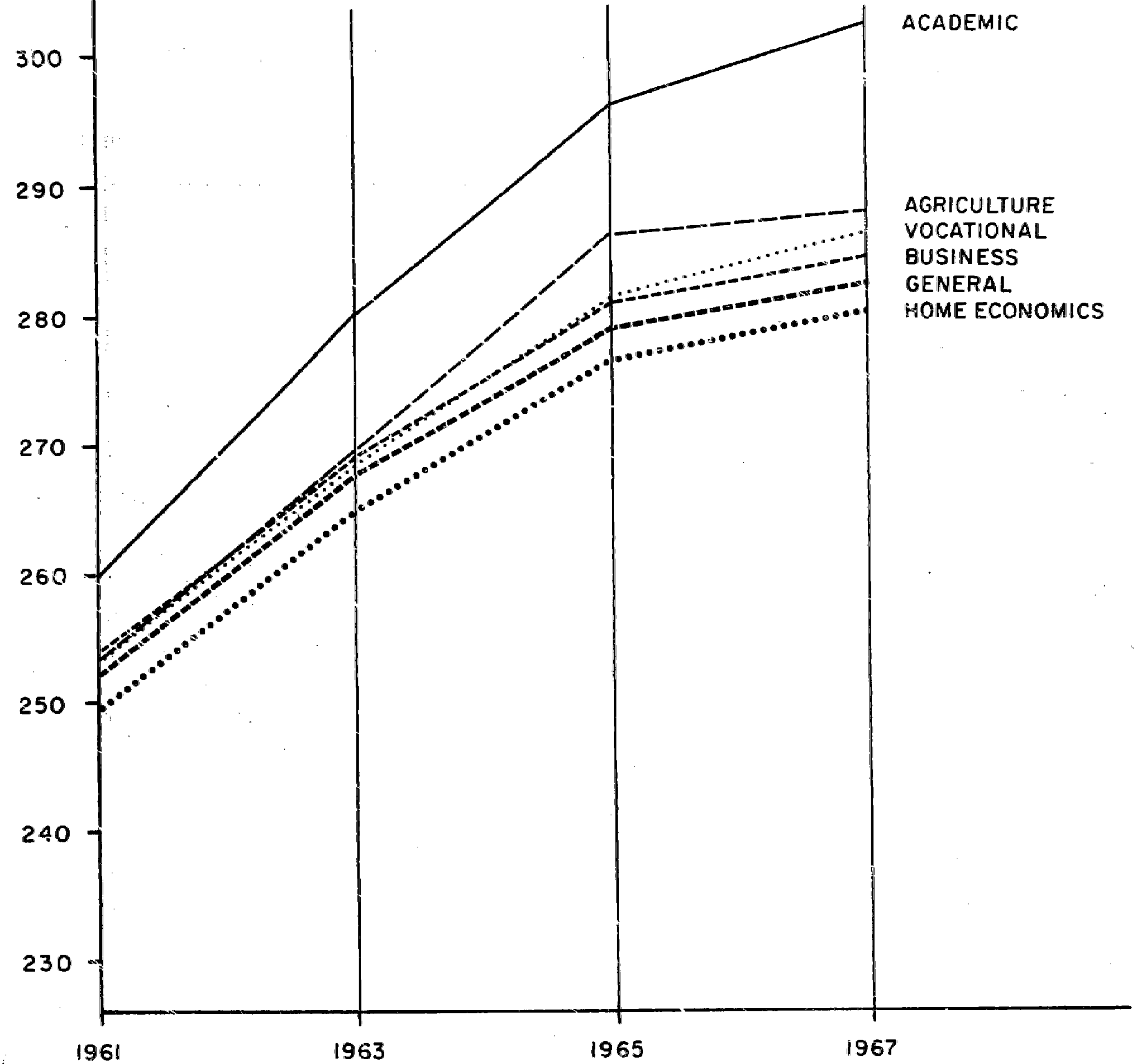

Figure E-2. Mean Scores on SCAT Quantitative for Six Major Curriculum Groups.

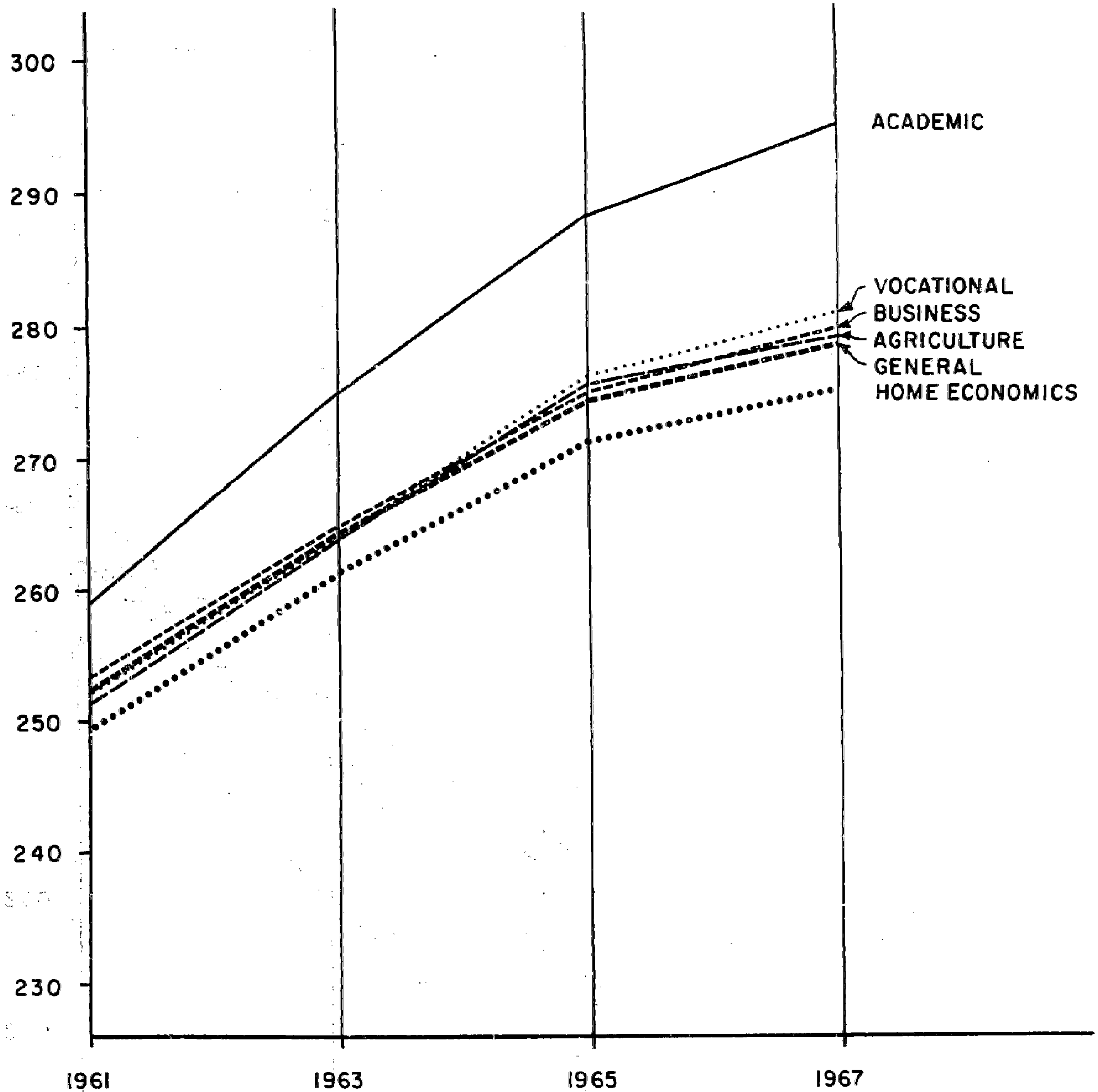

Figure E-3. Mean Scores on SCAT Total for Six Major Curriculum Groups.

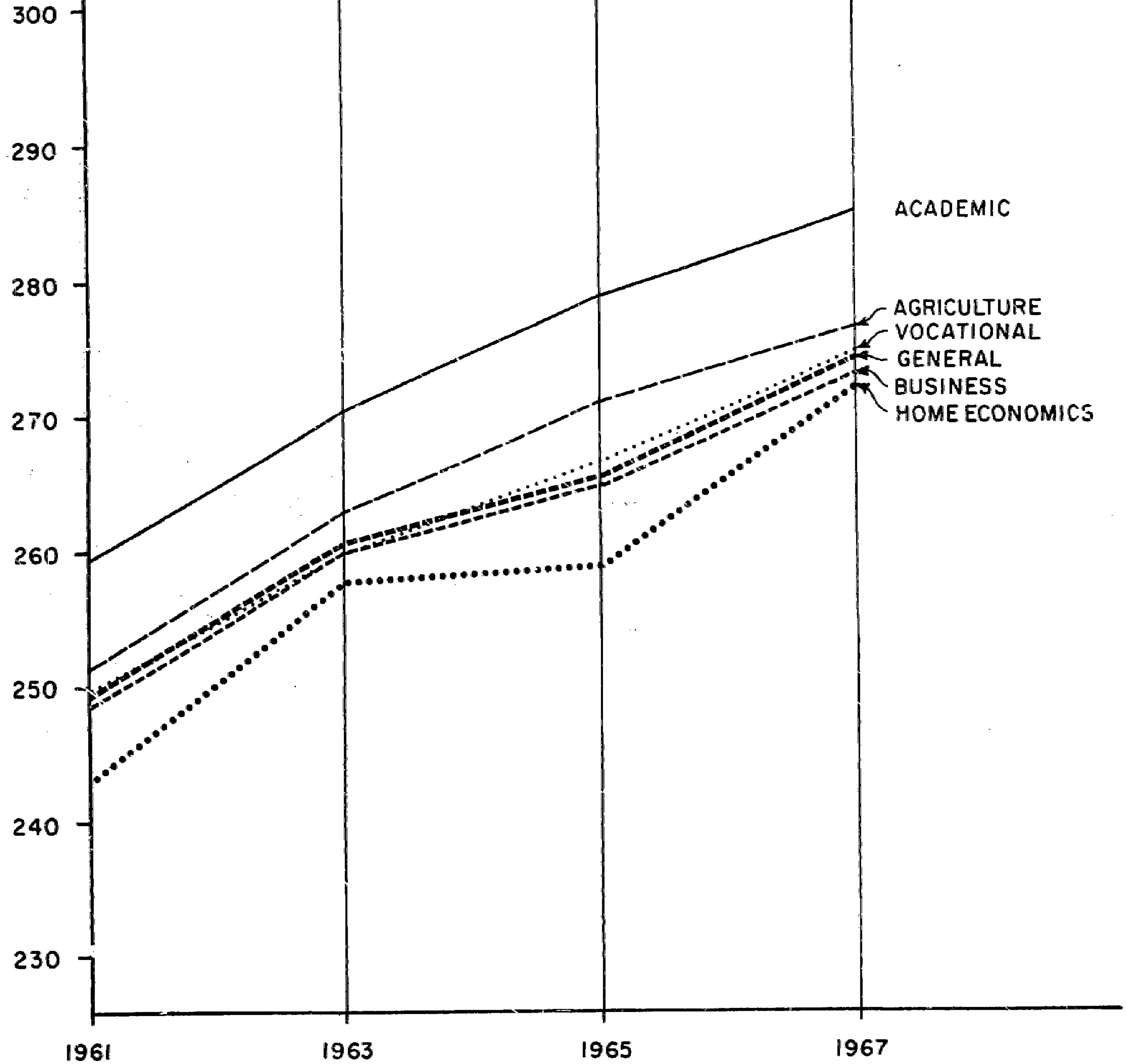

Figure E-4. Mean Scores on STEP Science for Six Major Curriculum Groups.

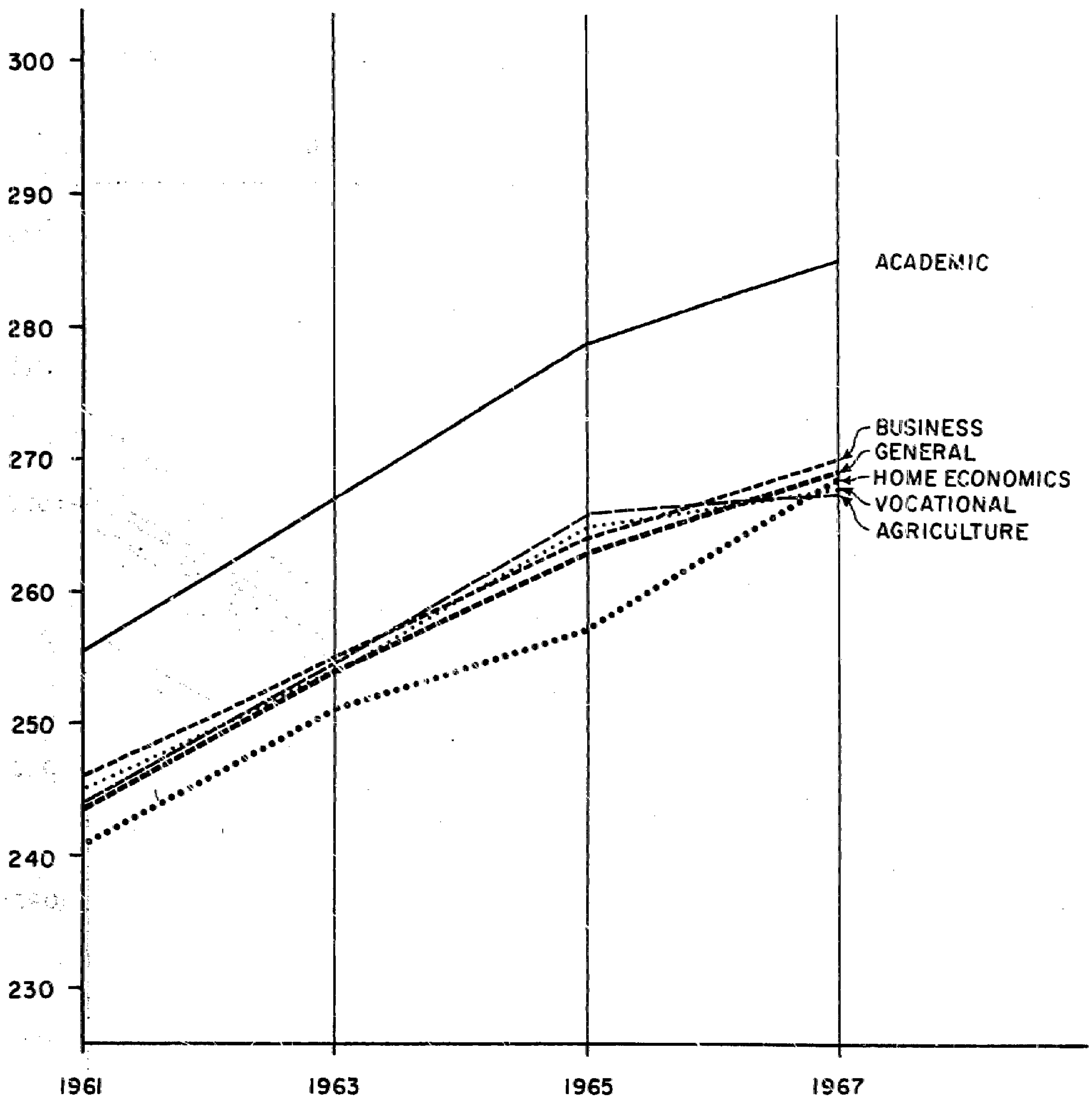

Figure E-5. Mean Scores on STEP Social Studies for Six Major Curriculum Groups.

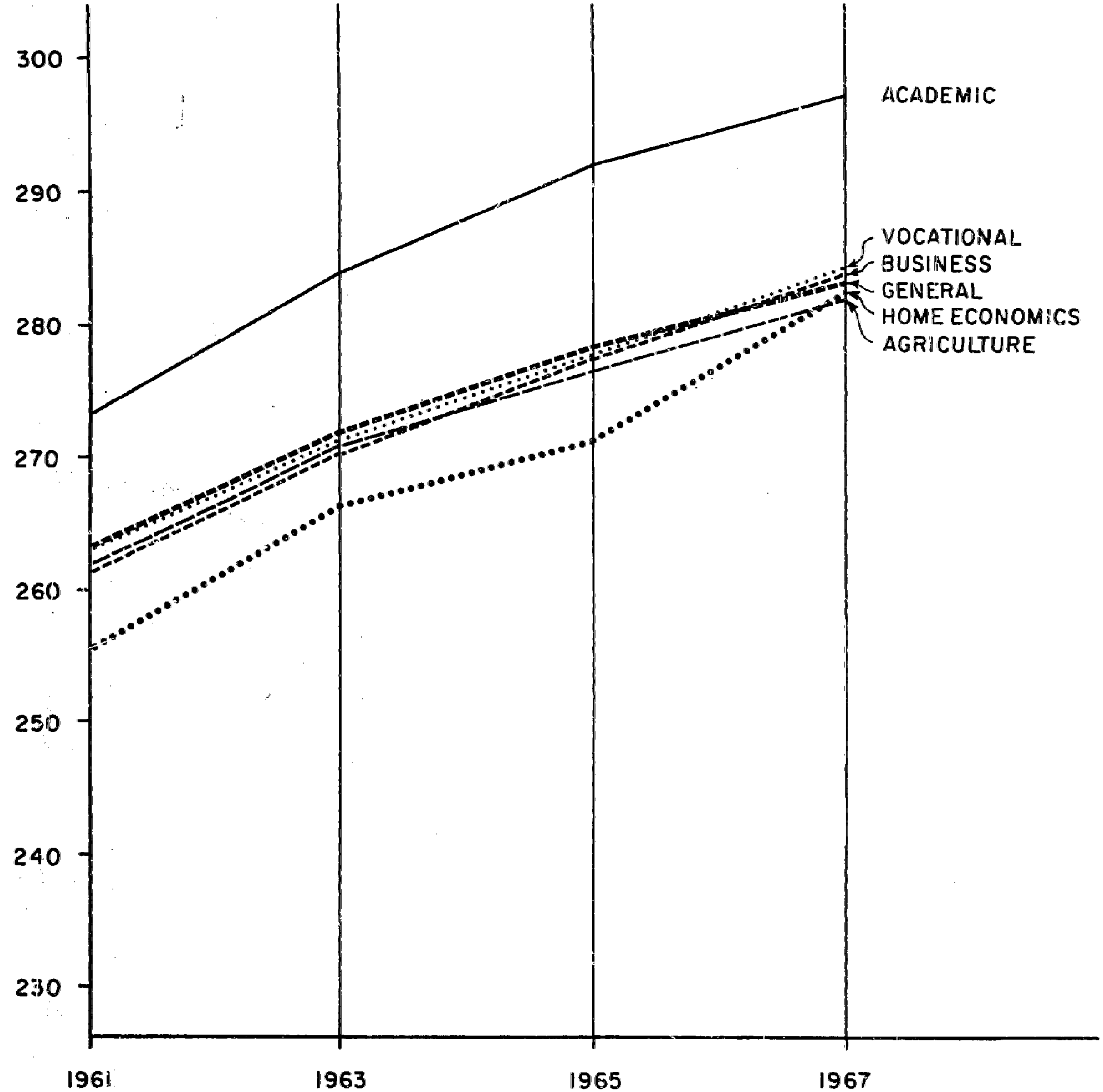

Figure E-6. Mean Scores on STEP Listening for Six Major Curriculum Groups.

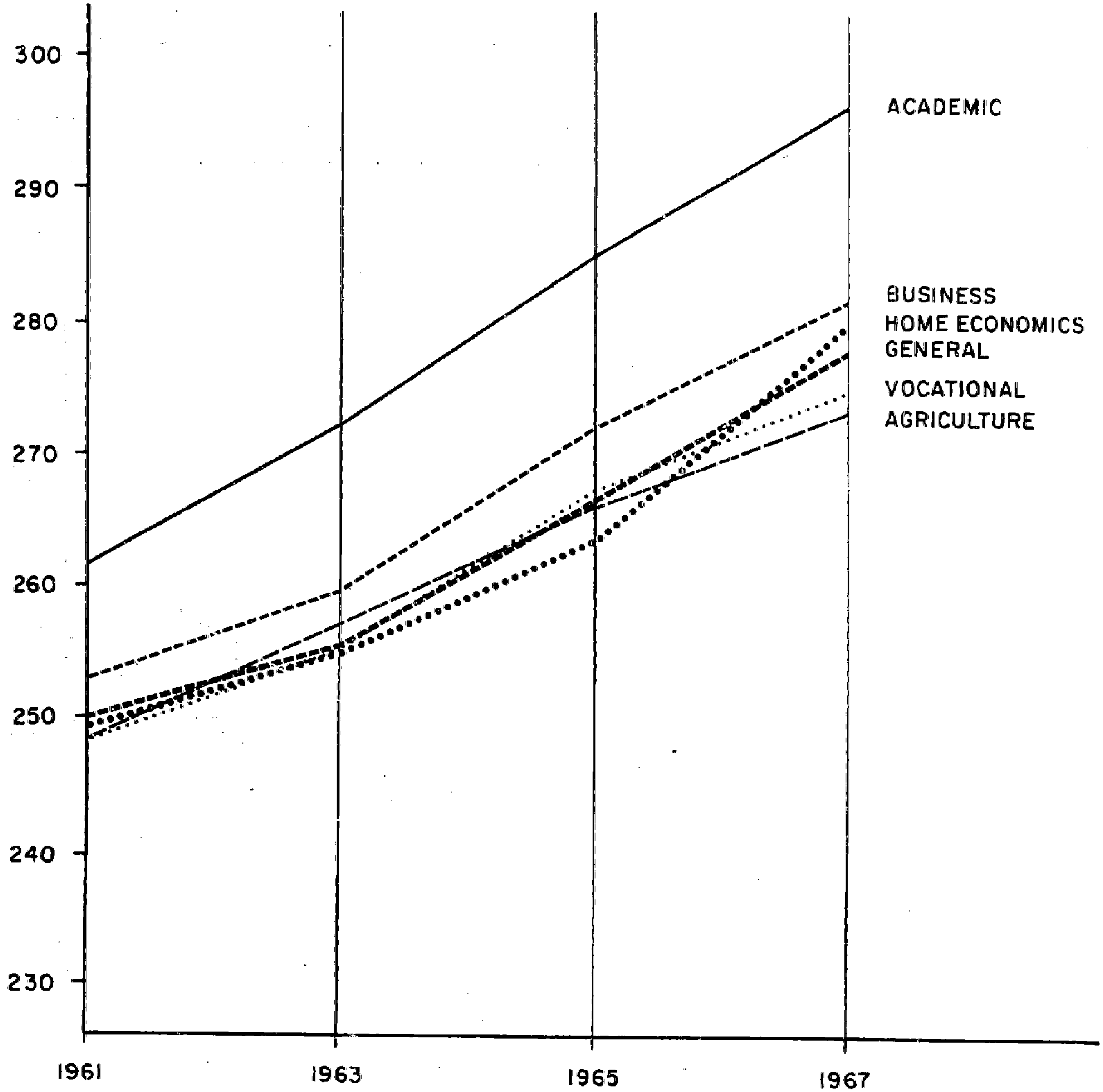

Figure E-7. Mean Scores on STEP Writing for Six Major Curriculum Groups.

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APPENDIX

Community and School Climate Questionnaire

I. The community in which school is located

A. Population ________ ____

B. To what larger population centers is the community oriented?

Name	Distance
________	________
________	________
________	________

C. Type of community

Agricultural
Industrial
Commercial
Suburban Residential
Mixed (explain)

large urban (100,000+)
medium urban (50,000 - 100,000)
medium self-contained (to 50,000)
small (-10,000) self-contained

D. Major industries in the community or within commuting distance (e.g., oil refining not "Shell," rubber not "Firestone")

E. The job market

1. Are there unemployment problems for either parents or young people? (Underline which, and explain)

____

____

____

2. What percentage of your students wish to enter the job market directly from high school?

Less than 10% ______; 10%-25% ______; 25% -50% ______; 50% or more ______

Are jobs available?

For all or most ______; For more than half but not most ______; for more than a few but not half ______; for only a few ______

What types of positions are available?

Unskilled ________ (Give examples) ________

Semi-skilled ______

Skilled ________

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F. Are there youth-serving agencies other than the school that help young people with employment problems in the community? What are they?

____

____

____

G. Are labor unions strong and active in the community?

____

Is this a help or hindrance to vocational students? In what respect?

____

____

H. How stable is the immediate community served by the school?

Immigration?

Emigration?

What groups are involved?

I. What is the ethnicity of students in this school? What is the "typical" occupational level of the various groups?

Ethnic Group

white native born ____________ % ____________

white foreign born ____________ % ____________

Negro ____________ % ____________

Other (Oriental, Mexican American)____% ____________

J. What is the approximate size of the area from which students may come with no tuition charge? ____________

Of the sending school districts? (i.e., of areas from which students come but are charged tuition.) ____________

K. Where is the school located?

1. In the center of the city of more than 100,000 ____
2. Outside the center but within the boundaries of a city of more than 100,000 ____
3. In a suburban community adjacent to a large city ____
4. In a self-contained community of 10,000 - 100,000 people ____
5. In a small community (2,500 - 10,000) ____
6. In a rural area or community of fewer than 2500 people ____

1. Proportion commuting outside community to work __________

Typical education and occupational level of these _______

2. Proportion working within area served by the school _____

Typical education and occupational level of these _______

M. To what extent do the facilities in this school fulfill the needs for technical and vocational instruction in this community? Explain

N. What percent of the students in this district (and in the sending districts) receive technical or vocational training?

1. In this high school ______________%

2. In a separate technical or vocational school within the district ____________________%

3. In a technical or vocational school outside the district

__________________%

4. Are there apprenticeship programs available? In what occupations? How many students are involved?

O. What percent of students in the district (and sending districts) go to private or parochial schools? ________________________%

1. Are these schools adequate (i.e., would more go to these schools if they were more adequate?) __________________%

2. In what ways are these schools deficient?

3. What ethnic and SES groups use these schools? ____________

____

P. Are there community, state or private, two-or four-year colleges nearby? Name ____________________

____

____

II. The School

A. How many grades are covered by this high school? 3, 4, or other? ______

B. List all programs other than college preparatory that are offered by the school.

1. ____________________ 4. ____________________

2. ____________________ 5. ____________________

3. ____________________ 6. ____________________

C. Within programs, list the specific jobs a student can train for. For example, under "business" one might be able to train for office management, secretarial, accounting, business machine operation or several other positions. Encourage informant to be as specific as possible. Use numbers corresponding to those in question above and additional paper as required.

1. ____________________ 2. ____________________

D. What are the facilities for students in vocational programs and how adequate does the respondent feel they are?

E. How many books are in the library? ____________

F. Are students identified with specific programs? i.e., is each student labelled as belonging to a separate curriculum?

____

What are the implications in terms of curriculum--are there separate English courses for students in the various curricula? Explain

G. How rigid is the track system --are students tracked "across the board" or subject by subject? How early does tracking begin?

H. What are the prerequisites for the various programs? (Try to elicit specific responses. If test scores are used, what are they and what is the cut-off point, etc? Also include minimum grades, subjects taken and personal attributes.)

I. Are students assigned to homerooms according to their programs?

J. How much contact do students have across programs in extracurricular activities? Note: drama club, musical activities, etc. as well as student government and athletics.

K. What is the faculty student ratio in the various programs? List by number in question II-B.

L. Are there work-study programs? ______________________

In what fields? ______________________

____

____

____

M. What is the school's policy on dropouts or potential dropouts?

How much attempt is made to keep students in school?

How is the potential dropout handled?

What is the legal school-leaving age with parents' consent? ________

Without it? ________

N. Are parents of students in all programs equally active in P.T.A. or other school-related associations? Explain

O. Does the school offer postgraduate work? In what fields?

P. What is the starting salary for teachers with a B.A.? ______________
Typical years in system? __________ Typical salary ______________

Q. What percentage of your graduates have gone on to college in the past five years? (Get percentages by curriculums)

1. ______________________________ 2. ______________________________

3. ______________________________ 4. ______________________________

5. ______________________________ 6. ______________________________

R. What is the per pupil expenditure in this school? __________ Does this figure include capital outlay? ____________ Can you break per pupil expenditure down by the various programs in this school? __________

III. Counseling

A. How much and what type of counselingdo students receive before entering a vocational or technical curriculum?

Individual

Group

B. Who counsels vocational students? (Professional counselors, who handle the college-bound students as well, special vocational counselors, subject-matter teachers, homeroom teachers.)

C. What kind of counseling do students receive as they move through the program?

Task	Average time per pupil
Course selection	______________
Achievement evaluation	______________
Guidance for further education	______________

Personal adjustment counseling ______________________________

Occupational information ______________________________

Job placement ______________________________

Job adjustment counseling ______________________________

Other ______________________________

D. How much time does each kind of counselor spend per pupil, per year and what kind of counseling does each do? Use categories under "C" above.

Guidance counselor ______________________________

Homeroom teachers ______________________________

Other (name) ______________________________

E. Thinking back now, what is the last situation in which you had a particularly satisfactory experience in counseling a vocational student? What was the problem and how did you handle it? (Check the type of counseling done and the type of information and material offered the student.)

A particularly unsatisfactory experience?

What are the five most frequent problems you encounter in advising vocational students?

F. What are the main strengths of your counseling program for nonacademic students?

G. What are the main weaknesses?

H. Are appropriate organizations such as labor unions in the community interested and involved with the vocational program at school? List: nature of relationship (advisory, etc.)

I. Do representatives of various occupations come to school to talk to students about their jobs or about opportunities in their fields?

J. Do students make field trips to local industries?

K. To what extent does the school assume responsibility for placement of vocational students?

L. Does the school conduct follow-up surveys on its graduates?

M. Do graduates ever return for postgraduate training or counseling?

N. What were the conditions under which this year's testing was administered -- were the students told how it might benefit them? Did they take the tests seriously?

O. Can you think of any distinctive or unique features of your school and its programs or of the students that might aid us in understanding why the mean SCAT & STEP scores of your students differ from students in other schools?

TEACHERS

1. What kind of training have most of the teachers of vocational and technical subjects had?

	YOU	OTHERS: Identify by Program or Course
College		
Graduate		
Major field		
Technical school (type)		
Occupational experience (in trade or industry, etc.)		

2. Do you do any vocational counseling?
   Is it formal? i.e., do you teach course in vocational adjustment or planning to class as a whole - or have regularly scheduled appointments with all students for counseling? (Get examples)

   Or informal? (On an individual basis, student initiated during class or outside of class)

3. What questions do students most frequently ask about the world of work?

TEACHERS (Cont'd)

4. Do students often ask about specific job opportunities after graduation?

5. Does anyone take the responsibility for placing students after graduation? Who?

6. What do you think of the vocational program at your school?

7. How would you improve your vocational program at your school?

8. Do you see any need to change or amend the vocational counseling in your school? How?

STUDENTS

1. How did you happen to enter the _______________ program?
   or, How did you decide on the _______________ curriculum?
   List all other factors mentioned:

2. Are you happy in this program or do you wish you were in another program? Why?

3. What are the most valuable things you are learning in the program? (list attitudes and skills)

4. How would you improve the program?

5. When you have a question about school work, whom do you go to?

STUDENTS (Cont'd)

6. Whom do you consult about vocational plans; that is, where do you obtain information about various occupations?

____

____

____

____

7. Do you have a part-time job now? What kind?

____

____

____

8. What do you plan to do when you graduate from high school?

Army __________ Job (type)______________

College__________ Other ______________

Further technical or vocational training (what kind)?

____

____

9. Run over the things that happened and your thoughts which led up to your present plan.

____

____

____

____

____

____

____

____

____

____

Vocational Development Study Follow-up Procedures

The sample of persons who were sent questionnaires on their activities during the first year after high school were all the June 1967 graduates of 26 high schools in the 17 communities of the study. Rosters of names and addresses of the 1966-67 seniors, provided by each high school, were compiled into a total roster of subjects. The receipt of addenda to some of the rosters, and of addresses that had not been provided on the first rosters, led to several hundred additional questionnaires being sent out about five weeks and twelve weeks after the initial mailing.

Each of the three mailings, including a covering letter, questionnaire, and postage-paid return envelope, was followed seven days later by a postal card reminder to everyone who had been sent a questionnaire. The postal card thanked those who had already completed and returned the questionnaire and reminded the others to do so. Fifteen days after the questionnaires had been mailed, a mimeographed letter of reminder was sent, in an air mail envelope carrying a real stamp rather than a postal meter impression, to the 59 percent whose questionnaires had not yet been received. Six weeks after the questionnaires had been mailed, new copies of the questionnaire with a covering letter and postage-paid return envelope were sent Air Mail Special Delivery to the 33 percent who had still not responded. This led to an additional return of about 1,000 more questionnaires, for a total return of 4,239 or 76 percent of the 5,570 sent out.

One of the major cities, with three high schools in the study, was not included in the above procedures. Because of their concern over giving their graduates' addresses to an outside agency, that school system carried out its own mailing and follow-up procedure. The follow-up was essentially the same as that described above, and resulted in almost precisely the same return rate. In the entire sample, including the city that handled its own mailing, 5,542 questionnaires were completed and returned from a total of 7,282 mailed, for a return rate of 76 percent.

The same procedures were followed with the 1965 graduates from two cities, including the one that conducted its own mailing. A total of 4,270 questionnaires were mailed; 3,058 were completed for a return rate of 72 percent.

Questionnaire Comments and Suggestions

Most of the items are concerned primarily with subgroups of the sample--employed, college students, people in the service, etc. When these items are left blank, there is no way to know whether the item is properly not appropriate for that person or he just skipped the item (and probably others too) out of carelessness or perverseness. Most of these items should be preceded by an item to classify the respondent, followed by instructions for the next items that depend on how the student classifies himself. Items like the following would remove that kind of ambiguity.

Preceding Item 14:

Do you have a regular, paid job?

(1) Yes ______________________.
(2) No ______________________. If you checked (2), skip Items 14, 15, and 16.

Preceding Item 17:

Do you have responsibility for keeping house?

(1) Yes ______________________.
(2) No ______________________. If you checked (2), skip Item 17.

Preceding Item 18:

Are you now looking for a job?

(1) Yes ______________________. Check B(3), B(4), or B(5) in Item 18.

(2) No ______________________. Check B(1) or B(2) in Item 18.

Preceding Item 19:

Are you now in one of the military services?

(1) Yes ______________________.
(2) No ______________________. If you checked (2), skip Items 19 and 20.

Preceding Item 21:

Do you attend any kind of regularly scheduled education or training classes?

(1) Yes ____________________.
(2) No ____________________. If you checked (2), skip Item 21.

Preceding Item 23:

Have you ever attended college at all?

(1) Yes ____________________.
(2) No ____________________. If you checked (2), skip Item 23.

Items 24 through 31 give a picture of the activities of the respondent through a period of time instead of at the particular time of completing the questionnaire, but the sequence of the activities is lost. Starting college and then quitting to get a job, for example, is indistinguishable from working for a few months and then starting college. Yet this is the kind of information needed to understand the different patterns of activities followed. It could be provided by putting a column of blanks to the right (or left) of Items 24 - 31 and following Item 31 with some such statement as the following: "Now go back and put a "1" in the blank space after that activity that was the first one you entered after leaving high school. Then put a "2" in the activity you started next. Number each of the activities you have engaged in to show the sequence in which you started each one."

The following comments refer specifically to the indicated items:

Item 13: For marital status, the category "Separated" was checked as often as the category "Divorced." It seems to be a useful category that properly identifies a pattern of living different from that associated with "Married," which is what most separated people would probably check if they did not have the "Separated" category.

Item 14: Less than one percent gave Response A(2), while about eight percent gave A(1). There seems to be little point in identifying those who hold down more than one job. Incidentally the letter 'A' was included in the response designation because if the instructions said to check '5' if you are unemployed, some people might have thought it referred to Item 5 and looked for it instead of Response 5. Telling them to check A(5) is unambiguous.

Item 21: In spite of a reasonably varied group of alternatives, there is no appropriate response for someone in a three-year school of nursing, or any other program between those leading to two-year or four-year degrees. The least-used response was C(4), which about half a percent of the 1967 graduates and one percent of the 1965 graduates used. It could probably be deleted without great loss, to make room for an item about college programs between two-year and four-year ones.

Another alternative is to split the college degree-credit programs from other kinds of educational programs with an introductory item like the one shown above to precede Item 21, but with three options instead of two:

_____ (1) Yes, in one or more classes that give me college credit.

_____ (2) Yes, in one or more classes that do not give me college credit.

_____ (3) No.

Each of the above alternatives should then direct the respondent to the appropriate amplifying item.

Item 32: There is no appropriate response for a married working woman who plans to quit work to become a housewife or to raise children. This might be corrected by making Response (7) read "Quit work or college to get married or to raise a family."

There should be a way for a person to indicate military service as his major activity for the next two or three years. Responses (1) and (2) might be merged to make room for a military service alternative. Those two responses do provide a distinction of some sort, accounting respectively for nine and eight percent of the responses, but whether that distinction is useful or not seems questionable.

One more minor point: If the items are numbered as they have been for ease of keypunching, there should be a statement on page one saying that there are no items numbered 1 to 10. Some people thought a page was missing when the first item they saw was numbered 11.

ADULT EXPERIENCES QUESTIONNAIRE

Spring, 1968

You can fill out almost all of this questionnaire with nothing but checkmarks, ~~but~~ where you are asked to write something, as in the blanks on the next page,

PLEASE PRINT

EDUCATIONAL TESTING SERVICE

Princeton, New Jersey — Berkeley, California

A. If your name has been changed from that shown on the cover page please pr
your present name here:

Name: ______________________, ______________________, ______________________
Last First Middle (or Maic

B. If your present home address is different from the address on the cover p
please print your correct address here:

____
Number and Street

______________________, ______________________, ______________________
City State Zip Code

C. What high school did you graduate from or last attend:

____
School

______________________, ______________________
City State

Section A

11. Sex: (1) ______ Male (2) ______ Female

12. Birthdate: ______________________

13. Present marital status (check only one):

(1) ______ Single

(2) ______ Married

(3) ______ Separated

(4) ______ Divorced

(5) ______ Widowed or Widower

If you are in active military service (not reserve training duty) skip items 14 through 18 and go to item 19.

Items 14 through 18 ask about your present employment and should be checked by everyone not in military service, even if you're not employed.

Items 21, 22, and 23 ask about the schools you have attended since high school. Items 24 through 31 ask about your activities for the last 8 or 9 months. Then item 32 asks about your future plans. All these items should be checked by everyone.

14. Check one of the statements below that best describes your present employment.

    If you are not employed because you're a student, because of sickness, because you can't find a job, or for any other reason, check A(5).

    A(1) ______ I work 48 hours a week or more on one job.

    A(2) ______ I work 48 hours a week or more on two or more jobs.

    A(3) ______ I work at least 30 hours but less than 48 hours a week.

    A(4) ______ I work at least 5 hours but less than 30 hours a week.

    A(5) ______ I work less than 5 hours a week.

15. Check one statement below that best describes how you got your present job. If you checked A(5) above, skip this item.

    (1) ______ Through a friend or relative.

    (2) ______ Through someone I knew on a previous job.

    (3) ______ Through high school.

    (4) ______ Through another school.

    (5) ______ Through a U. S., state, or other public employment agency.

    (6) ______ Through a private employment agency.

    (7) ______ By answering an advertisement.

    (8) ______ By applying directly to a person or company I thought might hire me.

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16. Please think back now to your senior year in high school and check below the one statement that best describes what you knew then about your present job and how you knew it.

If more than one statement is true, check the one that states how you learned most about what your job would be like.

(1) ______ I didn't know jobs like mine existed.

(2) ______ I knew there were jobs something like mine, but didn't really know what people in them did.

(3) ______ I knew what jobs like mine were like because I had known people in them.

(4) ______ I knew what jobs like mine were like because I had seen people working at them even though I didn't know the people.

(5) ______ I knew what jobs like mine were like because I had been told about them by my parents, teachers, counselors, or someone else who should know, even though not working in the job.

(6) ______ I knew what jobs like mine were like because I had worked in it, or in a job like it, before finishing high school.

17. We're interested in what your responsibilities are outside a paid job, so if you keep house, check the statement below that best describes your housekeeping activities. If you do not keep house, skip this item and go to item 18.

(1) ______ I live alone, keeping house only for myself.

(2) ______ I keep house with one other adult.

(3) ______ I keep house with two or more other adults about my own age.

(4) ______ I keep house with no other adults, but with one or more children.

(5) ______ I keep house with one other adult and one or more children.

(6) ______ I keep house without children but with more than one other adult, including at least one older adult.

(7) ______ I keep house with more than one other adult and one or more children.

18. If you are looking for a job, check one statement below that best describes what you are doing to find a job.

If you are not looking for a job, check B(1) or B(2).

B(1) ______ I am not now looking for a job, and probably would not take a new job if one were offered to me.

B(2) ______ I am not now looking for a job, but would probably take one if a good one came along.

B(3) ______ I look in the newspaper and talk to friends about jobs, but have not been to an employment agency in the past month.

B(4) ______ I have been to an employment agency within the past month to try to find a job, but have not actually applied to an employer.

B(5) ______ I have applied for a job to at least one employer within the past month.

Complete items 19 and 20 only if you are now in military service on active duty. If you are on temporary reserve training duty skip these questions and go to question 21.

19. How did you enter military service? (1) ______ I enlisted

(2) ______ I was drafted

20. Check the statement that best describes your plans for military service:

(1) ______ I plan to stay in for a military career.

(2) ______ I plan to get out as soon as possible.

(3) ______ I plan to stay in if I get the kind of duty I want.

(4) ______ I don't know if I will stay in or not when my enlistment is up.

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21. If you are in school, check one statement below that best describes the kind of school it is.

If you are not in school at all, check C(1).

C(1) ______ I do not go to any kind of school, or go less than 3 hours a week.

C(2) ______ I go to classes regularly at least once a week in connection with my job.

C(3) ______ I go to classes at least 3 hours a week for vocational training in a school that does not offer college credit. (For example: a school of cosmetology, or technician training).

C(4) ______ I go to classes at least 3 hours a week, but not for a job or college credit.

C(5) ______ I go to a junior college and take less than 11 hours of classes for credit.

C(6) ______ I go to a junior college and take 11 hours of classes or more for credit.

C(7) ______ I go to a 4-year college or university and take less than 11 hours of classes for credit.

C(8) ______ I go to a 4-year college or university and take 11 hours of classes or more for credit.

C(9) ______ I am in a full-time military training program or school (on active duty).

If you checked C(5), C(6), C(7), or C(8), complete the items in the box below, and then skip item 22.

Name of College:	______________________________
Field of Study:	______________________________ (For example: engineering, history, business)

22. If you are not now in college, check below what your plans are.

(1) ______ I have never attended college and have no plans to.

(2) ______ I have never attended college, but plan to within a year or two.

(3) ______ I have attended college, but left and do not plan to go back.

(4) ______ I have attended college and plan to go back within a year or two.

23. If you have attended college at all, whether you are in college now or not, check below how much college you have completed.

I have completed and have received credit for:

(1) ______ less than one academic year.

(2) ______ at least one but less than two academic years.

(3) ______ two or more academic years.

To learn the different patterns of employment and education different people follow, we would like to know what you have been doing recently. Would you circle one of the numbers after each statement below to give your best guess as to how much time you have spent in each activity since last September--about the last 8 or 9 months? One number after every item should be circled.

In the last 8 or 9 months I have ...	Not at all	Some time but less than 3 mos.	3 to 5 months	6 to 7 months	All the time
24. Worked at a permanent, full-time job	1	2	3	4	5
25. Worked at a temporary full-time job	1	2	3	4	5
26. Worked at a part-time job	1	2	3	4	5
27. Served in the military forces	1	2	3	4	5
28. Kept house	1	2	3	4	5
29. Gone to college full time	1	2	3	4	5
30. Gone to college part time	1	2	3	4	5
31. Gone to school for trade or vocational training	1	2	3	4	5

32 Now, to tell us what your plans are, please check the <u>one</u> statement below that best describes what you think you will do in the next two or three years.

(1) ______ Stay in my present job.

(2) ______ Stay in my present job except for promotions.

(3) ______ Look for a new job, or one better than the one I'm in.

(4) ______ Start college or go back to college.

(5) ______ Get more job training and then get a better job.

(6) ______ Leave college before I finish four years and get a job.

(7) ______ Quit work or college to get married.

(8) ______ Continue in college until I graduate with a four-year degree, then get a job, or get married, or both.

(9) ______ Go to graduate or professional school.

41				45				

80 (1)

Section B

If you are not now working and do not plan to work later on (for example, if you are a married woman without plans to work outside your home, or are physically unable to work), skip to Section C.

I. Suppose you were offered a permanent job in a city far enough away so that you would have to move if you took the job. Suppose also that you could move if you wanted to and have finished all the school or college you plan to get. Circle the number after each statement below to show how important that reason would be to you when deciding whether to take the job.

As an example, the line below, which says, "Live close enough to walk to work," has had a circle put around number 2, which means that reason would be below the middle in importance but would have some importance. If walking to work were very important, 5 or maybe 4 would have been circled.

	Not Important				Very Important
Live close enough to walk to work	1	2	3	4	5

Now circle some number on all the other lines to show how important each reason would be when you decide about the new job in a new city.

	Not Important				Very Important
11. A job that means I'm looked up to by other people	1	2	3	4	5
12. Interesting work	1	2	3	4	5
13. Easy work	1	2	3	4	5
14. Pleasant working conditions	1	2	3	4	5
15. A chance to do things my own way--make my own decisions	1	2	3	4	5

		Not Important				Very Important
16.	A good boss	1	2	3	4	5
17.	A chance to be in charge of things	1	2	3	4	5
18.	Medical insurance and life insurance paid by the company	1	2	3	4	5
19.	Variety in the job--different kinds of work	1	2	3	4	5
20.	A chance to be useful to society	1	2	3	4	5
21.	A chance to see what I can do--how good I am	1	2	3	4	5
22.	A good place to live	1	2	3	4	5
23.	A good retirement plan	1	2	3	4	5
24.	Good vacations	1	2	3	4	5
25.	Short working hours	1	2	3	4	5
26.	Steady work	1	2	3	4	5
27.	A chance to direct or supervise others	1	2	3	4	5
28.	Good pay	1	2	3	4	5
29.	A chance to move up in the world	1	2	3	4	5
30.	Good chances for promotion or advancement	1	2	3	4	5
31.	Good people to work with	1	2	3	4	5
32.	A job where you have to be good to handle it	1	2	3	4	5
33.	A chance to work by myself without a lot of other people around	1	2	3	4	5
34.	A chance to help other people	1	2	3	4	5
35.	A chance to try different things to see how I like them	1	2	3	4	5

If you are not now working in a paid job, skip to Section C.

II. If you were offered a good job in another city, as in the question just before this one, your decision to move would depend partly on how well you like your present job.

Circle the number on each line below to show how important each of the things listed is in your present job. If it isn't part of your job at all or is an unimportant part, circle number 1. If it's a big part of your present job, circle 4 or 5. If it's there, but not very important to you, circle 2 or 3.

	Not Important				Very Important
36. A job that means I'm looked up to by other people	1	2	3	4	5
37. Interesting work	1	2	3	4	5
38. Easy work	1	2	3	4	5
39. Pleasant working conditions	1	2	3	4	5
40. A chance to do things my own way--make my own decisions	1	2	3	4	5
41. A good boss	1	2	3	4	5
42. A chance to be in charge of things	1	2	3	4	5
43. Medical insurance and life insurance paid by the company	1	2	3	4	5
44. Variety in the job--different kinds of work	1	2	3	4	5
45. A chance to be useful to society	1	2	3	4	5
46. A chance to see what I can do--how good I am	1	2	3	4	5
47. A good place to live	1	2	3	4	5
48. A good retirement plan	1	2	3	4	5
49. Good vacations	1	2	3	4	5

		Not Important				Very Important
50.	Short working hours	1	2	3	4	5
51.	Steady work	1	2	3	4	5
52.	A chance to direct or supervise others	1	2	3	4	5
53.	Good pay	1	2	3	4	5
54.	A chance to move up in the world	1	2	3	4	5
55.	Good chances for promotion or advancement	1	2	3	4	5
56.	Good people to work with	1	2	3	4	5
57.	A job where you have to be good to handle it	1	2	3	4	5
58.	A chance to work by myself without a lot of other people around	1	2	3	4	5
59.	A chance to help other people	1	2	3	4	5
60.	A chance to try different things to see how I like them	1	2	3	4	5

79,80 (82)

Section C

If you are not working 20 hours a week or more, skip to Section D.

What is your job title? ______________________________

Below is a list of things people do on different kinds of jobs. Circle the number after each item that shows about how many times you have done that thing on your job in the past two weeks. Even if it's not formally part of your job, like talking with other people, if you did it while at work it should be counted.

If you have been sick or on vacation, think of your last two weeks on the job.

	Not at all	Once or twice	Several times	Many times
11. Supervised the work of another person	1	2	3	4
12. Conducted a chemical or laboratory test	1	2	3	4
13. Worked with numbers, arithmetic, or symbols	1	2	3	4
14. Operated a heavy machine (lathe, drill press, crane, lithograph, data processing equipment, etc.)	1	2	3	4
15. Drove a vehicle (truck, bus, bull-dozer, taxi, personal car if used on the job, etc.)	1	2	3	4
16. Looked up part numbers, stock numbers, or other numbers in a table or list	1	2	3	4
17. Took a stock inventory	1	2	3	4
18. Talked to a sales prospect	1	2	3	4
19. Prepared or served food	1	2	3	4
20. Carried out routine maintenance on machinery	1	2	3	4

	Not at all	Once or twice	Several times	Many times
21. Carried a gun	1	2	3	4
22. Operated a power tool (skil saw, jack hammer, etc.)	1	2	3	4
23. Sat or stood in one place for an hour or more at a time	1	2	3	4
24. Performed a personal service for a customer (set or cut hair, cleaned teeth, gave a massage, etc.)	1	2	3	4
25. Wrote a report or some other kind of original material (advertising copy, written specifications, etc.)	1	2	3	4
26. Spent 5 minutes or more with another person just loafing	1	2	3	4
27. Helped make another person comfortable physically	1	2	3	4
28. Read several pages or more of material connected with the job	1	2	3	4
29. Talked to a large group of people	1	2	3	4
30. Looked up technical information in a book	1	2	3	4
31. Sold something	1	2	3	4
32. Changed what I was doing so it wouldn't get boring	1	2	3	4
33. Waited on or gave information to a customer	1	2	3	4
34. Repaired an automobile or other machinery	1	2	3	4
35. Attended a training class	1	2	3	4
36. Talked for 5 minutes or more with another person about my job	1	2	3	4

		Not at all	Once or twice	Several times	Many times
37.	Played a musical instrument	1	2	3	4
38.	Talked about the things wrong with the job	1	2	3	4
39.	Collected payment from a customer	1	2	3	4
40.	Stood behind a counter	1	2	3	4
41.	Gave lessons or instructions to someone	1	2	3	4
42.	Worked as a paid entertainer	1	2	3	4
43.	Operated a small office machine, (typewriter, desk calculator, mimeograph, etc.)	1	2	3	4
44.	Worked at a drafting table (whether actually drafting or doing some other kind of work)	1	2	3	4
45.	Carried merchandise, equipment, or material for another person	1	2	3	4
46.	Checked, tallied, or posted numbers	1	2	3	4
47.	Used a hand tool (wrench, screw driver, soldering iron, etc.)	1	2	3	4
48.	Washed dishes, laboratory equipment, or other equipment	1	2	3	4
49.	Talked about union affairs	1	2	3	4
50.	Recorded gauge, meter, or indicator readings	1	2	3	4
51.	Repaired a piece of electrical or electronic equipment	1	2	3	4
52.	Sorted or inspected products	1	2	3	4
53.	Gave technical or professional advice or information to someone	1	2	3	4

		Not at all	Once or twice	Several times	Many times
54.	Spent most of my working day in one room	1	2	3	4
55.	Spent most of my working day outside	1	2	3	4
56.	Wore a hard hat or protective goggles	1	2	3	4
57.	Talked on the telephone	1	2	3	4
58.	Arranged a layout	1	2	3	4
59.	Lifted something heavy	1	2	3	4
60.	Read a technical or schematic drawing or blueprint	1	2	3	4
61.	Watched or guarded something	1	2	3	4
62.	Operated a testing instrument	1	2	3	4
63.	Handled money	1	2	3	4
64.	Washed up	1	2	3	4
65.	Corrected a mistake someone else made	1	2	3	4
66.	Ordered supplies or material	1	2	3	4
67.	Used a microphone or public address system	1	2	3	4
68.	Estimated costs or amounts of material	1	2	3	4
69.	Balanced figures	1	2	3	4
70.	Delivered merchandise	1	2	3	4

Now look back at the items in Section C that you checked having done. Pick out the three things you most liked doing and write their numbers in the spaces labeled A, B, and C on the left side of the page below. You don't have to pick three things if there aren't that many you liked.

If you have done something on the job in the past two weeks that is not listed, and that you liked better than all but one or two of the things listed, write "70" in one of the spaces labeled A, B, or C, and then write what it was that you liked in the space to the right.

We would like to know up to three things you do on the job that you enjoy. You can pick them from our list or write in your own. For the ones on our list, just write their numbers in the space; for ones not on the list, use "70" for the number and write in what they were.

58. (A) ______ ______________________________

60. (B) ______ ______________________________

62. (C) ______ ______________________________

Now look back again at the items in Section C that you checked having done and pick out the three you most disliked doing. Repeat the same procedures for them, writing their numbers in the spaces labeled D, E, and F below.

Again, if you have done something on the job that you disliked doing but that is not listed, write "70" in the space and then write what it was that you disliked in the space to the right. You can list up to three things you disliked doing, either from our list or things we haven't listed.

64. (D) ______ ______________________________

66. (E) ______ ______________________________

68. (F) ______ ______________________________

79,80 (83)

Section D

Please complete this section whether you are employed or not.

This is a list of some ways people spend their time when not working. Circle the number after each item that shows about how many times you have done that thing outside your job or outside classes at school in the past month.

		Not at all	Once or twice	Several twice	Many times
11.	Built or repaired something electrical or electronic	1	2	3	4
12.	Bowled, played golf, swam, or played some other active sport	1	2	3	4
13.	Went to a party	1	2	3	4
14.	Wrote a story, poem, play, or musical score	1	2	3	4
15.	Listened to "live" music	1	2	3	4
16.	Talked alone with someone my age of the opposite sex	1	2	3	4
17.	Rode a motorcycle	1	2	3	4
18.	Played cards--bridge, poker, cribbage, etc.	1	2	3	4
19.	Went to a play, lecture, or concert	1	2	3	4
20.	Read Jet	1	2	3	4
21.	Taught something to someone	1	2	3	4
22.	Cooked or sewed	1	2	3	4
23.	Cared for children or older adults	1	2	3	4
24.	Read Playboy or Cavalier	1	2	3	4
25.	Read a hot rod magazine	1	2	3	4

	Not at all	Once or Twice	Several times	Many Times
26. Played a musical instrument	1	2	3	4
27. Took photographs	1	2	3	4
28. Drove in a rally	1	2	3	4
29. Danced	1	2	3	4
30. Sang with some other people	1	2	3	4
31. Went to a movie	1	2	3	4
32. Went to a baseball game or other sports event	1	2	3	4
33. Watched a baseball game or other sports event on TV	1	2	3	4
34. Read a newspaper	1	2	3	4
35. Watched a play or documentary program on TV	1	2	3	4
36. Read a book	1	2	3	4
37. Took a lesson for something	1	2	3	4
38. Stood or sat around with several friends and talked	1	2	3	4
39. Discussed the Vietnam war	1	2	3	4
40. Painted, drew, or sculptured	1	2	3	4
41. Worked on a collection (stamps, coins, etc.)	1	2	3	4
42. Went to a public library	1	2	3	4
43. Watched a mystery, western, or adventure program on TV	1	2	3	4
44. Had an alcoholic drink with someone	1	2	3	4
45. Worked for a community organization	1	2	3	4

		Not at all	Once or twice	Several times	Many times
46.	Built or repaired something of wood or metal	1	2	3	4
47.	Listened to records	1	2	3	4
48.	Watched a comedy program or variety program on TV	1	2	3	4
49.	Worked on a car	1	2	3	4
50.	Worked with ceramics or jewelry	1	2	3	4
51.	Watched a newscast on TV	1	2	3	4
52.	Hiked or camped	1	2	3	4
53.	Talked about politics	1	2	3	4
54.	Went to a meeting of a social club or lodge	1	2	3	4
55.	Went out on a date	1	2	3	4
56.	Wrote a letter to someone	1	2	3	4
57.	Played with children (your own or others)	1	2	3	4
58.	Worked in a garden	1	2	3	4
59.	Read a comic book	1	2	3	4
60.	Cleaned the house or apartment	1	2	3	4
61	Drove around	1	2	3	4
62.	Went for a walk	1	2	3	4
63.	Met with a church group	1	2	3	4
64.	Listened to a speech	1	2	3	4
65.	Worked for a political organization	1	2	3	4
66.	Fished or hunted	1	2	3	4

	Not at all	Once or twice	Several times	Many times
67. Entertained friends at home	1	2	3	4
68. Studied	1	2	3	4
69. Left town overnight	1	2	3	4
70. Argued with someone	1		3	4

If some of the important or enjoyable things you have done outside your job or classes in the past month are not listed, check the space after G(1) below. Then describe up to three unlisted things you have done in the spaces below.

71. G(1) ________ ______________________________

____

____

79,80 (84)

Glossary

SCAT	School and College Ability Test (2 tests, Verbal and Quantitative, 50 items each)
STEP	Sequential Tests of Educational Progress (6 tests, Reading, Writing, Listening, Social Studies, Science and Mathematics, 70 items each)
TGI	Test of General Information (120 items provided 10 scales)
BEQ	Background and Experience Questionnaire (15 pages, 177 items)
PSAT	Preliminary Scholastic Aptitude Test (2 tests, Verbal and Math, 50 items each)
CEEB Tests	College Entrance Examination Board Tests (2 tests, American History and English Composition, 100 items each)
SES	Socioeconomic Status (derived from BEQ)

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